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UNIVERSITY OF MISSOURI-COLUMBIA

BULLETIN 1972

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GRADUATE CATALOG

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UNIVERSITY OF MISSOURI-COLUMBIA

Calendars for 1971-72 and 1972-73

First Semester

New Student Orientation
New Student Orientation and Registration
Registration
Classwork begins, 7:40 a.m.
Thanksgiving Recess begins, 5:00 p.m.
Classwork resumes, 7:40 a.m.
Classwork First Semester ends, 5:30 p.m.
Stop Day
Final Examinations begin
First Semester closes, 5:30 p.m.

1971

Wed., Aug. 25
Thurs., Aug. 26
Fri., Aug. 27
Mon., Aug. 30
Wed., Nov. 24
Mon., Nov. 29
Tues., Dec. 14
Wed., Dec. 15
Thurs., Dec. 16
Thurs., Dec. 23

1972

Wed., Aug. 23
Thurs., Aug. 24
Fri., Aug. 25
Mon., Aug. 28
Wed., Nov. 22
Mon., Nov. 27
Tues., Dec. 12
Wed., Dec. 13
Thurs., Dec. 14
Thurs., Dec. 21

Second Semester

New Student Orientation and Registration
Registration
Classwork begins, 7:40 a.m.
Spring Recess begins, 12:30 p.m.
Classwork resumes, 7:40 a.m.
Classwork Second Semester ends, 12:30 p.m.
Final Examinations begin
Second Semester closes, 5:30 p.m.
Annual Commencement

1972

Thurs., Jan. 13
Fri., Jan. 14
Mon., Jan. 17
Sat., March 11
Mon., March 20
Sat., May 6
Mon., May 8
Mon., May 15
Tues., May 16

1973

Thurs., Jan. 11
Fri., Jan. 12
Mon., Jan. 15
Sat., March 10
Mon., March 19
Sat., May 5
Mon., May 7
Mon., May 14
Tues., May 15

Summer Session

Registration and Orientation
Classwork begins, 7:40 a.m.
Independence Day Recess
Summer Session closes, 5:00 p.m.
Summer Commencement, Evening

Mon., June 12
Tues., June 13
Tues., July 4
Fri., Aug. 4
Fri., Aug. 4

Mon., June 11
Tues., June 12
Wed., July 4
Fri., Aug. 3
Fri., Aug. 3

BULLETIN

UNIVERSITY OF MISSOURI-COLUMBIA

Volume 72

Number 36

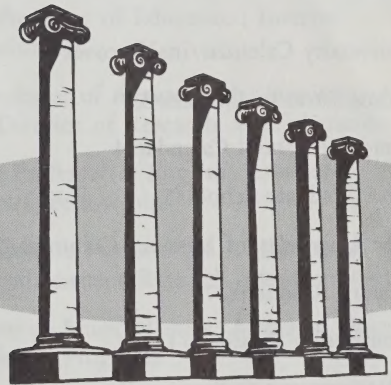
December 22, 1971

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Number 31

Robert E. Kren, *Director*, Office of Public Information
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Graduate Catalog 1972

UNIVERSITY OF MISSOURI-COLUMBIA

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Administrative Officers

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RICHARD A. BLOOMFIELD, B.S., M.S., Ph.D., Professor of Agricultural Chemistry;
Acting Dean of the Graduate Faculty and Director of Research Administration

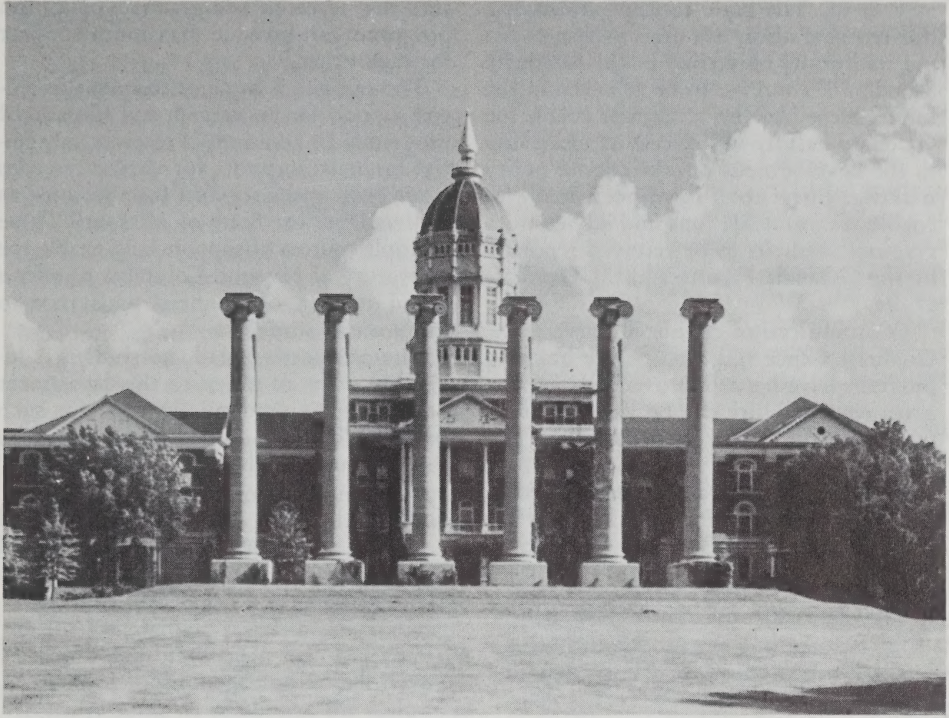
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Associate Dean of the Graduate Faculty—Social Sciences, Research Administration

ANDREW C. MINOR, A.B., M.M., Ph.D., Professor of Music History; Associate Dean
of the Graduate Faculty—Humanities, Academic Programs

Calendar of Special Graduate School Deadlines for 1971-72 and 1972-73

1971	FIRST SEMESTER (FALL)	1972
September 27	Final date for submitting dual enrollment applications	September 20
October 15	Final date for Comprehensive Examinations for the Ph.D. and matriculation for the Ed.D. (May Commencement)	October 13
November 1	Final date for filing applications for Master's degrees for those who expect to receive degrees at the close of the next semester. (May)	November 1
November 15	Final date for submitting theses and dissertations for advanced degrees.	November 13
December 15	Final date for Comprehensive Examinations for the Ph.D. and matriculation for the Ed.D. (August Commencement)	December 4
December 20	Delayed grades and <i>final oral examination</i> results for candidates for advanced degrees this semester are due in the Graduate Office.	December 18
December 20	Master's students not otherwise enrolled must have completed enrollment by this date.	December 18
1972	SECOND SEMESTER (WINTER)	1973
February 14	Final date for submitting dual enrollment applications.	February 9
March 31	Final date for filing applications for Master's degrees for those who expect to receive degrees at the close of the next semester. (August)	March 30
April 6	Final date for submitting theses and dissertations for advanced degrees.	April 2
May 5	Delayed grades and <i>final oral examination</i> results for candidates for advanced degrees this semester are due in the Graduate Office.	May 4
May 5	Master's students not otherwise enrolled must have completed enrollment by this date.	May 4
1972	SUMMER SESSION	1973
June 17	Final date for Comprehensive Examinations for the Ph.D. and matriculation for the Ed.D. (December Commencement)	June 15
June 27	Final date for submitting dual enrollment applications.	June 26
June 30	Final date for filing applications for Master's degrees for those who expect to receive degrees at the close of the next semester. (December)	June 29
July 7	Final date for submitting theses and dissertations for advanced degrees.	July 2
July 28	Delayed grades and <i>final oral examination</i> results for candidates for advanced degrees for this session are due in the Graduate Office.	July 23
July 28	Master's students not otherwise enrolled must have completed enrollment by this date.	July 23



The Graduate School

The University of Missouri granted its first Master's degree in 1846. A Graduate Department was first established in 1896 and the first doctor of philosophy was granted in 1899. The Graduate School at Columbia now offers 138 separate degree granting programs in 75 departments and areas, 60 of these being doctoral programs. It is a member of the Association of Graduate Schools and the Council of Graduate Schools. Enrollment is in excess of 4,000 graduate students of which approximately forty per cent are doctoral candidates. The campus in recent years has ranked among the 30 institutions in the country granting the largest number of doctorates. Total campus enrollment is over 21,000.

The objective of the Graduate School is to provide the atmosphere, the resources, and the programs which will permit a superior education for students interested in advanced work. An atmosphere in which academic inquiry is encouraged and intellectual creativity stimulated has long been

recognized on the campus as fundamental to the attainment of this objective.

It is further the philosophy of the Graduate School at the University of Missouri-Columbia that our advanced educational programs must be designed by the faculty to provide quality programs tailored to the particular intellectual objectives of the individual graduate student. This has required the careful development of responsible and highly qualified faculties in the various degree granting programs along with the very substantial support services and facilities which are available for graduate students on this campus. The array of disciplines represented in our 86 academic departments along with the genuinely cooperative research atmosphere prevailing on the Campus offers unique opportunities for graduate students and faculty to work across disciplinary lines.

The increasing importance of graduate education and research on the campus led to a reorganization of the Graduate School

in 1967-68. The basic concept underlying this reorganization has been to assure that the traditional objectives of the Graduate School will continue to be achieved in the future. Steps have been taken to enable the Graduate Faculty to exercise its leadership in the development of educational policy making. Provisions have been made to enable recommendations and advice from graduate students to be received regularly by the Graduate Faculty and the Graduate Office.

Communication channels between the Graduate Office and each degree granting program have been improved so that program responsibility can be vested increasingly with the faculty members of the program while central review procedures have been further developed and refined. Finally, the administration of campus research has been housed in the Graduate Office to as-

sure that research and graduate education programs can provide maximum support for each other.

The campus is a major recipient of federal support for its research and educational programs. In addition, it receives substantial financial support for these activities from both industry and foundations, as well as from the State of Missouri. These multiple sources of support help enable the University of Missouri-Columbia to offer a broad pattern of financial assistance to meritorious students.

The prospective graduate student is invited to write to me or to the department or area of his academic interest for such information as may not be provided by this Graduate Bulletin.

Richard A. Bloomfield
Acting Dean, Graduate School

The picture on page 5 shows "The Columns," more than a century old, in the center of Francis Quadrangle on the Red Campus. These traditional symbols of the University of Missouri-Columbia are all that remain of the original University building, Academic Hall, erected in 1840 and destroyed by fire in 1892.

UMC

UMC, the University of Missouri-Columbia, is the oldest university west of the Mississippi River and largest of the four campuses of the University of Missouri. In 1839, the University was established on the Columbia Campus; the designation was changed to UMC in 1963 when the University expanded to four campuses. The second oldest campus, the University of Missouri-Rolla, was established as the Missouri School of Mines and Metallurgy in 1870. In 1963, two campuses were added—the former private University of Kansas City which became the University of Missouri-Kansas City and the University of Missouri-St. Louis.

At Columbia, the campus combines what are locally termed the “red campus,” and the “white campus.” The west or red campus, known for its many red brick buildings, includes Francis Quadrangle. Here in the Quadrangle stand the six Ionic columns which have been formally declared a campus monument and which have informally come to symbolize the Columbia Campus and its historic traditions. The columns are all that remain of the original Academic Hall, built in 1840 and destroyed by fire in 1892. The block-long UMC Library connects the east and west campuses. The buildings on the east campus are of indigenous white limestone.

Also located on the Columbia Campus are the Colleges of Arts and Science, Agriculture, Engineering, and Education; the Schools of Forestry and Home Economics in the College of Agriculture; the School of Medicine, and the School of Nursing, a division of it; the Schools of Business and Public Administration, Law, Library and Informational Science, Journalism, Social and Community Services, and Veterinary Medicine; and the Extension Division.

LIBRARY RESOURCES

The libraries on the Columbia Campus contain 1,541,000 volumes, 81,000 reels of microfilm, 815,000 units of other microforms, and more than 20,000 maps. In addition to the main library building, which has a shelf capacity of more than a million volumes, informational resources are housed

in eight libraries located in other buildings: Atomic Space Sciences, Engineering, Geology, Journalism, Law, Mathematical Sciences, Medicine, and Veterinary Medicine. In addition, there are a number of Laboratory collections which are supervised by staff of the respective departments. The library system is organized by subjects. Within the UMC Library building, in addition to an Undergraduate Library, are the following libraries: Art, Archaeology, and Music; Geography, History, and Philosophy; Education and Psychology; Business and Public Administration; Social Science; Library Science; Language and Literature; and Science.

Supplementing the resources of the UMC libraries are the library of the State Historical Society of Missouri and the Western Historical Manuscripts Collection, both located in the main library building.

The research collections and teaching materials of the library have been developed with a view of placing at the disposal of investigators and scholars generally, the published results of investigations made all over the world. Special collections are acquired as they become available. Likewise, gaps in the collections of journals are constantly being filled. Some of the outstanding gifts and collections in the library are described below.

The library offers special assistance to the graduate student in locating and acquiring materials from other libraries in the United States and from libraries in some foreign countries. Bibliographic specialists are available to aid the graduate student in his research. This service includes the location of printed and manuscript materials in other libraries in the United States and abroad, and the acquisition for students and faculty of photo and microfilm copies of scarce items which cannot be secured in any other form.

The UMC Library is a member of the Center for Research Libraries of Chicago, through which the 44 member libraries store and/or acquire cooperatively one copy of lesser-used research materials. These are available for extended loan to the member libraries.

The library also participates in a cooperative program for acquisition of all important foreign books by research libraries in

the United States. In the program, known as the Farmington Plan, each institution agrees to purchase all materials within certain subject areas. The plan is operative in most Western European and several Latin American countries; as arrangements are made, other countries will be included. UMC receives all books in the fields of Advertising, Animal Husbandry, Journalism, and Wildlife Conservation.

The Association of Research Libraries, which sponsors the Farmington Plan, also sponsors a foreign newspaper microfilm project. Microfilm copies are acquired currently of more than 150 newspapers, selected to cover the world. The collection is kept in Chicago but is available for extended loan to each participating library.

The graduate student or other researcher must have organized finding lists of books and articles covering the various fields of knowledge. The library's collection of bibliographic books is strong, containing more than 6,000 volumes and including the library catalogs of most of the world's outstanding libraries. With these are the standard American and British national bibliographies and the principal ones of France, Germany, Italy, and Spain, together with those of several of the Latin American countries. Of equal importance are the great subject bibliographies and abstracting and indexing services which lighten the labor of the investigator. Most of those covering the fields emphasized at UMC may be found here.

The libraries are serviced by a staff of 50 librarians and more than 100 full-time clerical workers, plus a large number of student assistants. The usual tasks incident to the acquisition and lending of books are speeded by a modern computer and extensive teletype equipment. Many types of microform readers are available to the student. The library also maintains reproducing equipment with which, for a small fee, copies may be made of most library materials.

The library, which occupies an entire city block, is air-conditioned and provides seating capacity for 2,400 readers in its reading rooms. For the use of graduate students are some 30 carrels and more than 800 individual lockers. Some 30 seminar rooms, each seating ten to fourteen

people, are available for use as specialized graduate study rooms.

Below are details and statistics of specific offerings of the libraries of the Columbia Campus.

More important than total volume numbers in a library is the percentage held by the library of the monumental sets and journals of the several fields of knowledge. By the measuring sticks available, the UMC collection of books and journals in the fields in which it offers graduate instruction ranges from adequate to strong. It is not practicable here to measure the book collections of each department in this manner, so a numerical summary will be given. For this purpose the collection will be divided into the Social Sciences, Humanities, Biological Sciences, and Physical Sciences.

THE SOCIAL SCIENCES AND THE LAW

The combined Social Sciences and Law collections contain about 500,000 volumes, divided roughly in this way: Economics, 55,000; Education, 70,000; History, 100,000; Law, 125,000; Political Science, 100,000; and Sociology, 25,000. Over 800 current journals fall into this classification. Several thousand federal and state documents are included in the figures for Economics and Political Science. This division of the library is fairly strong in early journals and treatises on Education. Materials on modern Europe and Great Britain and America provide the major strength of the historical section of the library. A special collection of bibliographic tools and journals serves the recently inaugurated School of Library and Informational Science.

The Law Library in Tate Hall contains both the original and the reprints of the English reports of the British Empire consisting of the Australian, Canadian, Irish, Indian, Scottish, South African, and Colonial reports; an almost complete collection of the federal and state reports and statutes, as well as the necessary digests, encyclopedias, and treatises. There is a good general selection of the various services reporting administrative regulations and rulings, new court decisions, new statutes, and amendments to existing laws which

are rich in materials for students in the study of administrative bodies. The collection on International Law is currently being strengthened.

THE HUMANITIES

The Humanities, to which we may assign Literature, Philosophy, Religion, Fine Arts, and Journalism, are next in size with 175,000 volumes. Literature, which contains a particularly strong Shakespeare collection, has 95,000 volumes. American Literature has been strengthened by the acquisition in recent years of numerous files of early American literary periodicals and works of minor writers. Most of the literary journals of any importance before 1875 have been acquired in the original or on microfilm. Included in Literature are the materials of Speech, a field which is currently undergoing growth. The Paul LeJay Library represents the outstanding special collection the library possesses in the field of Humanities. It contains 6,000 volumes.

Fine Arts, with strength in art history, painting, and music, contains 30,000 volumes; Philosophy, 25,000; and Religion, 20,000. The gift to UMC of the 5,500 volume library of the Bible College of Missouri in 1937 greatly strengthened the holdings in this field.

The Frank Lee Martin Memorial Library, named after the second Dean of the School of Journalism, is housed in Walter Williams Hall, one of the three Journalism buildings. It contains over 15,000 volumes relating to Journalism, and receives virtually all of the periodicals devoted to this subject in any of its phases, including radio, advertising, and free-lance writing. The library receives regularly at least one daily newspaper from each state in the Union, and one or two from each of the important foreign countries. The bound files of newspapers and microfilm copies of back files have been mentioned elsewhere. It is well to remember that the Journalism Library contains primarily the materials used in everyday instruction. It is supplemented by related research material shelved in the general and other divisional libraries on the campus. The same condition holds for all branch libraries.

THE BIOLOGICAL SCIENCES

The Biological Sciences of Agriculture, Botany, Medicine, Psychology, Zoology, and related fields maintain some 125,000 volumes. The Medical Library, which now contains approximately 85,000 volumes, is being developed rapidly to support the medical program of UMC. The Veterinary Medicine Library, a 15,000-volume library, is a small but select collection chosen for veterinary practice and research. The library is particularly strong in the basic sciences; at present subscriptions are in effect for 1,200 journals.

THE PHYSICAL SCIENCES

The volumes in Physical Sciences may be estimated at 100,000, which is exclusive of society and other general publications. Engineering leads with 35,000 volumes, most of which are housed in its library in the Engineering building. Among the periodicals received are the standard publications in the field. Geology is next with 15,000 volumes; Chemistry, 15,000; Physics, 10,000; and Mathematics, 7,000. Most of the strength naturally is in journals. A special library serving professors and graduate students in Atomic and Space Sciences is maintained in the Research Park.

SPECIAL COLLECTIONS

The Library of the State Historical Society, which shares the Library building, has an extensive collection of Missouriana and the early West. This collection comprises 375,000 volumes, including 15,000 bound volumes of Missouri newspapers and 5,200 bound volumes of Missouri magazines and college periodicals; 5,200 items in the Bay Collection of the Society, which is a unit in itself; 185,000 duplicate volumes of Missouri official publications; 18,000,000 pages of Missouri newspapers on positive microfilm; 300,000 pages of original manuscripts; 3,060 rolls of United States Census covering Missouri and 46 other states; 496,800 pages of manuscripts on microfilm; 150,000 items of Missouri state archives; over 19,500 engravings, lithographs, paintings, photographs, pictures, portraits, and original drawings of cartoons; and 86,000 maps,

scrapbooks, and World War I and II letters, records, and clippings. The library is available to faculty, students, and the public.

The Western Historical Manuscripts Collection was established in the UMC Library in 1943 with the assistance of the Humanities Division of the Rockefeller Foundation and in 1962 was incorporated into the State Historical Society of Missouri. Its primary objective is the preservation of materials relating to the region of the Missouri River and the Great Plains. Letters, diaries, personal accounts of travelers, business and professional records, memoirs of early western people, and other papers of interest to this region are among the materials being collected. Photographic equipment is available for reproducing rare papers which cannot be acquired in the original.

Western Americana. Emphasis here has been on Missourians and materials relating to the Great Plains. Similar general boundaries have been set up for the manuscripts collection. The book collection naturally spills over to follow the Oregon and Santa Fe Trails and the westward movement to California. Missouri's part in the development of the West brings much of western historical materials within the field of Missouriana and ties the State closely with all phases of the early history of the West. The collection has been developed in close connection with the Library of the State Historical Society, which is especially strong in western materials, so that duplication has been held to a minimum. In 1942 the Society acquired the J. Christian Bay Collection of Western Americana comprising 2,900 volumes and containing many of the rarest printed items relating to the West. The Society's library is also noted for its outstanding collections of Mark Twain and Eugene Field.

In 1940 the UMC Library acquired a special collection of about 1,000 volumes of western Americana, bringing its holdings in this special field to about 6,000 volumes. Several hundred volumes a year are being added. Already then, the libraries of the two institutions contain original or film copies of a large percentage of the important titles relating to the West. The collections are especially rich in travel narratives and contemporary accounts of life

among the pioneers. They also contain some unusual Indian items.

Advertising. This area has been set aside as one in which the library will specialize. The more than 1,500 volumes on advertising available in the Frank Lee Martin Memorial Library at the School of Journalism constitute only the beginning of what the University of Missouri-Columbia and the School are resolved to make into a comprehensive and distinguished collection of books on this subject. New advertising publications are added as rapidly as they appear, and search continues for out-of-print volumes in the field.

American Speeches and Sermons. The collection contains approximately 1,200 speeches and sermons printed in America before 1800 and about 500 Fourth of July orations delivered during the first half of the 19th century. Its development will be continued.

Crime and Criminology. The Lawson collection of crime and criminology consists of about 1,500 volumes. These publications for the most part are reports on famous trials written in popular style. They were used by Judge Lawson in the preparation of his *American Trials*. It is part of the Law Library and is housed in Tate Hall.

Federal Documents. The library has been a depository for Federal documents since the turn of the century and has full sets of its publications. The documents of Missouri and of the states of this region are collected along with a selection from all of the states of the Union. In the last decade or so there has been a great increase in the number of documents issued; federal documents, especially, have increased in number and importance. The library receives microprint copies of all federal and United Nations publications.

Among the documentary publications of other countries to be found in the library are: *Hansard's Parliamentary Debates*, *Parliamentary Papers—1910-date*, *Journals of the House of Lords and House of Commons*, and *Foreign State Papers of Great Britain*; *Journal Officiel* and *Archives Parlementaires* of France; and the German *Stenographischer Bericht...des Reichstags*. There are also miscellaneous files of documents from these

and other foreign countries, especially Latin America.

Flach Collection. This collection was assembled by Professor Jacques Flach, a French jurist, historian, and teacher, and acquired by the library in 1920. It contains 6,000 volumes, and is especially strong in early French law, comparative law, and legislation; it is rather strong also in the history of Alsace-Lorraine and medieval France. Additions in these fields are being made regularly.

Johnson Collection. A gift of approximately 1,600 volumes from the library of the late Thomas Moore Johnson of Osceola, Missouri, was received in 1947. The collection consists principally of classical literature, philosophy, and medieval Christian theology. It is rich in works of the 16th and 17th centuries and adds greatly to the resources of the library in the fields covered.

LeJay Collection. This is a private library of 6,000 volumes purchased by the library in 1921. The collector was a professor of the Catholic Institute of Paris, a member of the Institute of France, and an editor and author of note. The collection's strength lies chiefly in classical philology and literature, and in theology. It represents 30 years of collecting by Professor Paul LeJay. Included in the collection are many 16th and 17th century imprints, rare editions, and products of early presses.

Other Gifts and Special Collections. The library is strengthened each year by the donations from friends of the University. Not many years ago the William Benjamin Smith library of 3,000 volumes in mathematics, physics, philosophy, and religion was presented to the University. In 1937 the Bible College of Missouri gave its library of about 5,500 volumes on religion; and later the Luther M. Defoe mathematics library of 3,000 volumes came from the estate of the late Professor Defoe. The Irion collection, a professional library in education, was founded several years ago, and funds are provided annually for its increase. Approximately 400 volumes from the late Dr. Theophil W. H. Irion's private library were presented to UMC early in 1953 by Mrs. Irion.

COMPUTING FACILITIES

UMC provides excellent modern computing services for the support of the educational and research programs of the campus. General computing services for faculty and students are provided by the Computational Services Center, which operates an IBM 360/Model 65 with a full range of peripheral equipment. A network of terminals is being implemented to provide direct access to the computer from several locations on campus. A Calcomp plotting service is also available at the Center. The Center is available to graduate students for work on assigned educational problems and on dissertation research, with program error consultation provided.

The Computer Engineering and Development Center is a specialized facility which includes an IBM 360/Model 50 and an SEL 840A computer providing a unique resource for analog to digital computing needs. In addition, this Center provides student computing services for the College of Engineering and works in the area of program and hardware development.

The Medical Computer Center provides on-line computing services to the University Hospital and Medical School, operating an IBM 360/Model 50 computer.

There are other small computers on the campus for specialized research work in various laboratories or for administrative work. Overall, there are unusually fine computer facilities available to support the needs of the campus.

MUSEUMS AND COLLECTIONS

ART MUSEUMS AND COLLECTIONS

Museum of Art and Archaeology

The museum collections are comprised of art objects representative of all parts of the world and periods from the paleolithic to the present. Among the more than 3,000 items in the museum are many groups or single pieces of special importance for graduate research and publication. The collections of greatest strength are in primitive art—African, Oceanic, and Central and South American—ancient art of the Near

East, Egypt, Greece, and Rome, and the Kress Study Collection of Italian Renaissance Painting. Among the most recent additions to the museum collections are finds made in excavations in the upper layers of a site in Upper Galilee, Israel, with many pieces dating as far back as 3000 B.C. These finds, which are shared with Israel, were taken on digs at the Tel Anafa site in 1968, 1969, and 1970 under the direction of Dr. Saul S. Weinberg, Professor of Classical Archaeology and Director of the Museum.

The Museum, located on the fourth floor of the Library, publishes *Muse, Annual of the Museum of Art and Archaeology, University of Missouri-Columbia*.

The Cast Gallery

The Cast Gallery of the Department of Art History and Archaeology is a unique collection of some fifty full-size plaster reproductions of Greek and Roman statuary. The Gallery is located on the third floor of Jesse Hall.

OTHER MUSEUMS AND COLLECTIONS

Museum of Anthropology

The Museum has extensive collections of American Indian archaeological and ethnological materials, as well as modest amounts of anthropological specimens from other areas of the world. Some of these artifacts are displayed in the Museum Gallery, Room 100, Swallow Hall. Four courses in museology are taught each semester, and a number of students are involved with the osteology laboratory, conservation projects, and display construction.

Archaeology of Missouri and surrounding areas is studied by the Division of American Archaeology and the Missouri Archaeological Survey, located at 15 Switzler Hall. Some of their important finds are on display at the Museum.

The Museum of Anthropology publishes the *Museum Briefs Series* and other occasional papers.

Entomology Museum

The collections, comprising some 750,000 specimens, are housed in Room 3-38, Agriculture Building.

This major insect collection in the state is primarily for research and teaching programs, with only a very small portion exhibited. Besides insects, there are other groups of Arthropoda, notably spiders and mites. The Director is Wilbur R. Enns.

Geology Museum

Among the more than 100,000 specimens in the museum, the invertebrate collections are especially rich in fossils of Devonian, Mississippian, and Pennsylvanian rocks of Missouri and the mid-continent; the vertebrate collections are largely of Pleistocene mammals. The collection of Conodonts is the most varied and nearly complete of its kind in the world. The collections of fossil Charophytes represent all known localities in North America and contain reference material from South America, Europe, Asia, and Africa; it is the most nearly complete collection of fossil Charophytes in existence. The Paleontologic collections of the Missouri Geological Survey are also located here.

The mineral collections contain several unusually fine assemblages; the most complete suite extant of materials from the famous Crestmore locality in California, many of them in crystal form; one of the finest collections of boron minerals known in this country; an especially fine set of garnets; many excellent crystals from the lead and zinc mines of southwest Missouri, gathered when those mines were first opened and never again to be duplicated. The clay mineral collections contain a complete set of A.P.A. reference clay minerals as well as type clay materials from most of the important clay deposits of the world.

More than 1,800 species are represented in the Dana collection. There is an especially fine collection of polished fossil woods in the Dermuth collection. The curator of the paleontological collections is Dr. James H. Stitt; the curator of the mineralogical collections is Dr. Alden B. Carpenter.

The Herbarium

The plant collection in 226 Tucker Hall is valuable for regional research, but teaching materials include a general collection,

largely from North America, with approximately 5,000 specimens from Central America. Areas of specialization include desert ecology, agrostology, and the genera *Crataegus*, *Lupinus* and *Quercus*.

The collections of approximately 150,000 specimens include about 35,000 mycological specimens, plus over 50,000 not processed, and the entire private collection of Edward J. Palmer, who was a noted authority in the genera *Crataegus* and *Quercus*.

An E. J. Palmer scholarship is available in systematic botany on alternate years. The Herbarium Curator is David B. Dunn.

Zoology and Wildlife Collections

The Zoology Department has extensive teaching and research collections of the vertebrate animals of Missouri and surrounding states. The mammal and bird collections (both skins and skulls) are curated by Dr. William H. Elder. More than 100 species of mounted waterfowl of the world are on display from the Glen Smart collection in the lower corridor of Lefevre Hall.

The herpetology collection is managed by Dr. D. E. Metter. This collection has some 8,000 specimens of amphibians and reptiles. The emphasis is on U. S. species, but there are representatives of many foreign groups.

The freshwater and saltwater fish collection is managed by Dr. A. Witt, Jr. There is a Marine Aquarium for marine invertebrates and a collection of preserved fish with some 25,000 specimens including about 3,000 fresh- and salt-water fish from Thailand; the remainder are fresh-water fish principally from Missouri and the Midwest and salt-water fish from the Atlantic, Pacific, and Gulf coasts.

RESEARCH CENTERS AND RESOURCES FOR THE SOCIAL SCIENCES AND THE HUMANITIES

CENTER FOR RESEARCH IN SOCIAL BEHAVIOR

The Center for Research in Social Behavior is a research and training facility

operated by social science faculty on the UMC campus. It was established on July 1, 1966 to incorporate the activities of an earlier, less formally constituted Social Psychology Laboratory. The Center is supported by research contracts and grants, and by State funds administered through the Graduate School.

The major goals for the Center are (1) to conduct and (2) to promote social science research at the University of Missouri-Columbia.

In order to conduct programs of social science research, the Center provides facilities, equipment, office accommodation, and services needed in programs of field and laboratory investigation, maintains a social environment in which research and graduate training in the social sciences are facilitated, and sponsors lectures, seminars, and visits from scholars in the social sciences from this campus, from others in this country, and from abroad. Research programs in the Center reflect a variety of theoretical and applied interests in the fields of social science.

RESEARCH CENTER OF THE SCHOOL OF BUSINESS AND PUBLIC ADMINISTRATION

Resources and facilities of the Research Center of the School of Business and Public Administration provide opportunities for research training and experience to candidates for advanced degrees in the six departments of the School. The Center's broad organization gives research focus in Consumer and Political Behavior, Economic-Social Development, Manpower Studies, and Public Policy Analysis. Additionally, the Center has a unit that conducts attitude surveys and field studies.

PUBLIC OPINION SURVEY UNIT (POSU)

The Public Opinion Survey Unit of the Research Center, School of Business and Public Administration, consists of two divisions: a survey research organization and a data archive. The POSU survey research organization offers services to faculty, students, governmental agencies and private organizations in the following areas: research design; sampling; questionnaire

construction; field interviewing; coding, tabulation, and data processing; and analysis of data.

POSU maintains a field staff of professional full- and part-time interviewers in close proximity to its statewide sampling points. It conducts statewide amalgam surveys, as well as surveys of special population groupings.

In addition to its field section, POSU includes a data library with holdings from four sources: POSU field surveys; all Inter-University Consortium for Political Research data holdings; studies conducted by other scholars, especially in the area of comparative American state politics; and comparative cross-cultural studies acquired on an ad hoc basis from sources such as the International Data Library and Reference Service (Berkeley). Access to other data archives in the United States and Western Europe is facilitated by POSU's membership in the Council of Social Science Data Archives.

POSU has also inaugurated the *Missouri Poll* series, in conjunction with the UMC Office of Public Information. The *Missouri Poll*, presently carried by over 130 Missouri newspapers, consists of popularized reports on the social, economic, political, and attitudinal characteristics of Missourians.

THE FREEDOM OF INFORMATION CENTER

The Freedom of Information Center maintains a day-to-day study of the more notable actions by government, media, and society affecting the movement and content of information. Some results of the Center's study are published either in a month-

ly report series or a bi-monthly newsletter received by approximately 2,000 newspapers, broadcast stations, libraries, and scholars.

The Center has offices in Neff Hall of the School of Journalism. The FoI Center serves journalism students and other mass communications researchers throughout the world, in addition to students and faculty of UMC.

THE UNIVERSITY OF MISSOURI PRESS

The University of Missouri Press, headquartered on the Columbia Campus, was established in 1958. The Press publishes scholarly books in all disciplines and accepts submissions from scholars across the nation. Currently publishing at the rate of 15-20 new titles per year, the Press has firmly established its role in the effective communication and dissemination of significant scholarship.

CULTURAL OPPORTUNITIES

Since graduate education can not be limited to the classroom, laboratory, or library, students should avail themselves of the broad and rich intellectual experience offered on the Columbia Campus and in the community. The concerts, lectures, art exhibits, and dramatic productions presented on campus enable the student to gain personal contact with some of the most vital personalities and forces of our age. In addition to those on campus, there are many interesting cultural events pre-



sented by the other colleges in Columbia which are also available to students. Qualified students may participate in the local musical and dramatic productions on campus.

RESEARCH CENTERS AND RESOURCES FOR THE PHYSICAL AND BIOLOGICAL SCIENCES

The University of Missouri-Columbia has excellent resources in equipment and services to support research in the Natural Sciences. Most of these facilities are related to individual programs and are described in the listings elsewhere in this bulletin for departments and areas. There are, however, several unique resources available on a Campus-wide basis that enrich the opportunities available in graduate study in the Natural Sciences. Several of these are described below.

SPACE SCIENCES RESEARCH CENTER

The Space Sciences Research Center at Columbia is part of a University-wide space sciences program supported by the State of Missouri as an adjunct to the national goals in space and environmental sciences. The Center is producing knowledge which will lead to a better understanding of how man and animals adapt to or modify environments for their continued survival. A broad-based program of basic research and graduate training is supported by the Center in cooperation with various departments on the Columbia Campus.

The Center is housed in a new building in Research Park, located just south of the main campus. There are excellent facilities in the building for conducting the research programs of the Center. These programs are focused in the areas of environmental physiology and control/information theory as applied to biological systems. In addition to individual projects carried out by the investigator, the Center is now supporting broad-based interdisciplinary studies concerning the environment.

Altogether more than 25 faculty members and approximately 15 separate dis-

ciplines are involved in Center-related activities, with close to 30 graduate students directly associated with projects at Columbia.

SINCLAIR RESEARCH FARM

The Sinclair Research Farm is a permanent University-wide service facility to aid research on aging and chronic disease. It is designed to house and care for farm and other laboratory animals under controlled conditions for their entire lifetimes.

In the past, most biological research information has come from work with the smaller, shorter-lived animals. At the Sinclair Research Farm, research also is conducted using longer-lived animals having organs, basic foods, societal stresses, and diseases somewhat more similar to those of humans than is the case with the smaller animals. Thus, as researchers follow the life-span of these longer-lived animals, dividends are expected to follow in contribution toward better knowledge of the human aging processes.

For example, researchers working with a herd of inbred hemophiliac hogs have made discoveries which may lead to more effective treatment of the 400,000 persons in the United States suffering from this condition. Other studies, involving ground squirrels, are contributing to a larger project studying the properties of blood, including changes in blood during hibernation. It is expected these studies may eventually have considerable bearing upon the possibility of human hibernation during long-term space travel.

Other animals involved in research at the Sinclair Research Farm include African sheep with heart disease, mice genetically bred to be alcoholics, and Angus cattle with genetically transmissible epilepsy. The study populations also include miniature pigs whose diseases—arthritis, heart defects, ulcers, and others—closely parallel human health problems.

The Sinclair Research Farm is located on 563 acres just outside of the city and adjacent to the Columbia Campus. Its operations are under the direct supervision of an experienced veterinarian. Among the researcher and services specialists active in the farm's program are geneticists, pathologists, veterinarians, medical doctors, com-

puter experts, biologists, and similar types of life-science investigators.

UNIVERSITY OF MISSOURI RESEARCH REACTOR

The Research Reactor, a University-wide facility, is a high-flux reactor designed to operate at a power of 10 MW. It is water-cooled and moderated and is reflected with beryllium metal and graphite. The innermost region of the reactor is a "flux trap" providing a neutron flux greater than 10^{14} neutrons per square centimeter per second. This region and the pool experimental positions are easily accessible from the pool surface for insertion and removal of experiments.

The reactor services the following experimental facilities:

1. Center test hole, or "flux trap."
2. Three 6-inch beam tubes.
3. Three 4-inch beam tubes.
4. Four pneumatic tube irradiation positions.
5. Eight reflector region irradiation positions.
6. A 4 x 4 foot graphite thermal column used for neutron radiography.

A ^{60}Co irradiator, containing approximately 13,000 curies of ^{60}Co , is installed at the Research Reactor facility and available for irradiating samples in either air or water. A "hot cell" for remote manipulation of radioactive samples has also recently been installed.

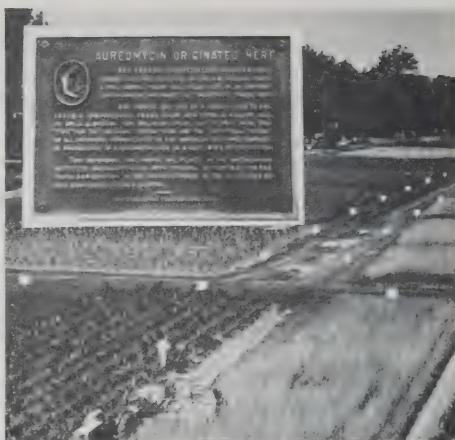
The Reactor facility is widely used by faculty and graduate students in many departments, including Physics, Nuclear Engineering, and the life sciences. The excellent nuclear and supporting instrumentation makes possible a wide range of experimental activities.

RESEARCH FARMS

Research Farms of the College of Agriculture

The University of Missouri-Columbia has many farms near Columbia for research with field and horticultural crops and livestock. Supplementing these farms are land, laboratory, greenhouse, and large animal facilities at four outlying centers in the State to implement agricultural research on problems peculiar to the area surrounding them.

The most famous area of these farms is the Experiment Station's Sanborn Field.



It was in plot number 23 on this field—oldest experimental field west of the Mississippi River—that Aureomycin was discovered in the soil. The antibiotic was isolated in 1945, the 59th year in the plot's cropping history.

Research Farm of the School of Veterinary Medicine

The veterinary medicine research farm is a 90-acre farm located within a 10-minute drive of the UMC campus. The facility is equipped for chemical analyses, hematology, and chromatography. Major equipment includes an automatic liquid scintillation spectrometer and an ultra centrifuge. Equipment for germ-free animal experiments is available in two separate facilities. Another building houses small laboratory animals used for various veterinary medicine research projects. Holding locations are available in several areas including a large barn.

The emphasis of veterinary medicine research is on transferral effects of drugs on newborns, metabolism of drugs in newborns, and effects of drugs on the fetus in utero. Other research involves the study of the effects of neoplasms on the host.

WHOLE BODY COUNTER

The low-level whole body liquid scintillation counter, which is operated by the College of Agriculture, is used extensively by research workers in several divisions of UMC. This unique facility is large enough to screen an entire adult man or 1,000-pound animal.

REGULATIONS FOR ADMISSION AND CONTINUATION

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted on the basis of this record alone. Higher GPA's and additional requirements may be established by individual departments for acceptance into their degree program. If a student wishes to be accepted into a degree program but has a lower GPA, the approval of the appropriate department is required. However, if such a student wishes to enroll on a non-degree basis, the approval of the Graduate Dean is required.

Admission to the Graduate School does not in itself entitle the student to candidacy for an advanced degree. Advanced degrees are earned through fulfilling the requirements of a graduate program of study which a student follows under the auspices of a Department or Area of the Graduate School. Requirements of the individual departments or area programs are described in this bulletin. A student must fulfill both the Graduate School minimum admission requirements and the departmental admission requirements to be accepted to work for an advanced degree. Further, to be granted an advanced degree, the student must have satisfied requirements and regulations of the Graduate School and of the department of his field of study. Generally the over-all requirements regarding procedures, residence, time limitations, application forms, and such for Masters' and Doctors' degrees are given in this section. Those requirements specific to the departments and areas are listed in that section. As indicated in each presentation, a student is invited to write the departmental or area director of graduate studies for answers to specific queries regarding admission, courses, financial aid, or other information.

Acceptance to a Degree Program

An applicant for admission to the Graduate School should write the Director of Admissions, 130 Jesse Hall, UMC, Columbia, Missouri 65201, for application forms. The applicant completes and returns the forms and also arranges for official tran-

scripts from each undergraduate or postgraduate institution to be sent to the Director of Admissions.

To be eligible for admission to the Graduate School, a student must have a degree from an accredited college. His application is reviewed by his proposed major department, and acceptance is a requirement for admission.

All credentials must be in the Admissions Office four weeks before the student plans to start graduate work, including, in the case of students from other countries, the results of the Test of English as a Foreign Language (TOEFL).

Required Tests

A Graduate Record Examination score is required of all graduate students except in those departments requiring Miller Analogies, Terman Concept Mastery, or ATGSB—the Admission Test for Graduate Study in Business. Results of these tests must be on file in the Graduate Office prior to official action by the Admissions Office pursuant to your application. If these scores are not available the student may be admitted (with permission of the Graduate Dean) on probation; however, the test must be taken during the first semester of enrollment. In no case will a student be permitted to enroll for a second semester of graduate work at UMC without his GRE or other scores being available at the Graduate Office.

The Graduate Record Examination

Applicants taking the GRE must submit scores on the aptitude test of the GRE, but either at the request of the department concerned or of his own volition, the applicant is encouraged to submit additional scores on one or more advanced subject matter tests of the GRE.

The GRE is given six times a year—in October, December, January, February, April, and July—at a great many locations in the United States (including Columbia) and in many foreign countries. To determine exact dates and the most convenient locations, students should write to the

Educational Testing Service, Princeton, New Jersey 08540. Applications are required several weeks prior to the examination, and scores are received about a month after the examination. Hence, it is necessary to apply for the GRE in early September for admission in January and in early March for admission in September.

Admission to a Non-degree Program

A student not interested in working for an advanced degree may be admitted as a non-degree student on approval of the Dean of the Graduate School. Should the student later desire to become a degree candidate, he would have to be accepted by the department or area in which he wishes to work.

Graduate students who are not candidates for a higher degree may, with the approval of the Dean of the Graduate School, select their work for the special purpose for which they have the requisite preparation. They are not required to select a major adviser or field of specialization and are advised in the Graduate Office. "Non-degree" students are expected to maintain a satisfactory grade average in all courses attempted.

Should such students subsequently desire to become candidates for a degree, only that part of the work will be accepted which in the judgment of the adviser or advisory committee belongs in the field of specialization and contributes to an advanced degree in the field. The student will be required to complete whatever work is necessary for fulfilling the requirements of the degree.

Admission on Senior-Graduate Basis (Dual Enrollment)

Seniors at UMC who are within 15 hours of completing the requirements for graduation may, if they fulfill the requirements, enroll concurrently for the semester in the Graduate School for courses sufficient to make a full program. To be considered for dual enrollment, a senior must be in the upper-half of his class and have the approval of the appropriate Dean. A senior who qualifies must complete his dual enrollment within one month after the start of the semester. Students who graduate with excess credits without registering in

the Graduate School will *not* receive graduate credit for that work.

Students from Foreign Countries

Prospective students living outside the United States and its possessions are advised to write the Foreign Student Adviser, Read Hall, Columbia, Missouri 65201, at least a year prior to the date of desired admission. Information and forms concerning admission, scholarships, housing, and approximate expenses will be sent to the student. Application papers and official records of previous school work should be furnished the Director of Admissions, 130 Jesse Hall, Columbia, Missouri 65201. Upon approval, the student will be notified by an official letter. No prospective student should make plans to leave his country without first receiving a Form I-20 from the Foreign Student Adviser.

Students from countries where English is not the native language must take the Test of English as a Foreign Language (TOEFL) given by the Educational Testing Service, Princeton, New Jersey 08540. This test is given approximately four times per year in test centers in almost every country of the world. Large countries usually have a number of test centers. The test should be taken from six to nine months before the opening of the session in which the student wishes to enroll. A satisfactory score must be made on this test before formal application forms are sent.

The *Foreign Student Handbook* and other bulletins are available from the Foreign Student Adviser on campus. International students are made welcome and are encouraged to take advantage of the informational and guidance facilities provided for students from foreign countries.

Enrollment Required

Students who are working toward advanced degrees are required to enroll in the Graduate School. This requirement includes those seniors who are enrolled concurrently in an undergraduate college and in the Graduate School and who wish to receive graduate credit for part of their program. This enrollment requirement includes not only courses which are part of a program for an advanced degree, but

also those undergraduate courses which receive no graduate credit and those courses which a graduate student may be taking as a hearer. A student's enrollment is expected to reflect the course work and research in which he is engaged. Even though he may not need the credit or may have met his residence requirement for the Doctor's degree, he is still expected to enroll for an amount of work which reflects his activities.

Description of Courses

All courses offered by the Graduate School are described in detail at the end of this bulletin. All courses, graduate and undergraduate, offered at UMC are described in the *General Catalog*. The *Schedule of Courses*, issued approximately four weeks prior to the opening of each semester, lists the period, the building, and the room assigned to each course offered in that semester.

The University of Missouri-Columbia reserves the right to cancel without further notice any course listed in the schedule or to withdraw any course which does not have an adequate enrollment at the close of the registration period.

Registration Procedures

Permits to Enroll. New students who qualify for admission and who have submitted an advance payment on their incidental fees will be issued a permit to enroll along with a registration packet. Packets and permits will be picked up by the student in the Graduate Office. An application for admission and all transcripts must be on file not later than August 1 for graduate students who enter the fall semester. New students who enter the winter semester should submit credentials before December 1, and for the summer session, before May 1.

Permits and packets for the winter semester are made automatically for all students who are enrolled in UMC during the fall semester. Students who are enrolled during the winter semester will be issued a packet automatically for the following fall semester.

Graduate students who are enrolled for the winter semester will be automatically issued a packet for the summer session.

Also, graduate students who were enrolled for the previous summer session will be issued a packet automatically.

Pre-Registration. Enrolled students may complete registration for the ensuing semester during the pre-registration periods, usually held in November and April. New students may register in advance for the fall semester during the pre-registration period in June and July.

Payment of Fees. Student registration is not complete until all university fees are paid.

Late Enrollment. A student who registers late for the fall or winter semester must pay \$25.00 late registration fee in addition to the regular fee.

Petitioning into or out of a Course. A student wishing to withdraw from one course or enter another during a semester must secure the approval of his adviser and his Dean. Blank petition forms and instructions are available in your Dean's office. Only under extenuating circumstances may a student enter a course after three weeks of the semester have elapsed. A \$5.00 fee is charged for one or more petitions in change of course filed at any one time.

Dropping Courses

Graduate students are allowed up to six weeks (eight weeks in the case of a 400-level course) from the beginning of the semester to petition out of courses with an excused grade. Beyond this period a student must have a letter signed by the instructor stating specifically that he has a grade of *B* or better in the course. Those students with less than a *B* are not permitted to drop after the stated period.

Maximum Registration—Work Load

The maximum registration in the Graduate School is 16 credit hours per semester, or 8 credit hours for the Summer Session. If a graduate student is employed as a teacher, the total hours of courses taught plus courses taken may not exceed 18 hours. That is, a graduate student who is teaching full time—12 hours—is allowed to take a maximum of 6 hours graduate work; a student employed half-time may enroll for a maximum of 12 hours graduate work. An exception to this rule may be made for the student teaching mathematics or

foreign language. The department chairman should be consulted in these cases.

Attendance

A record of class attendance, in general, is not kept for graduate students; students finding it necessary to be absent, however, especially before or after holidays, are advised to so inform their instructors.

Veterans who wish to claim subsistence are expected to attend classes regularly.

Auditing Courses. Students who wish merely to attend lectures, including veterans who do not intend to receive subsistence for a given course, are expected to enroll as "hearer."

Grading

The grades of graduate students in all courses which count toward an advanced degree are reported as *A*, *B*, *C*, and *F*. The grade *A* means that the student's work in a course is of outstanding merit. The grade *B* means that a student's work in a course is entirely satisfactory. The grade of *C* means that the student's work in a course will be acceptable only to a limited extent in fulfilling the requirements for advanced degrees. There is no *D* grade for graduate students. The grade *F* means that the student's work in a course has not satisfied the minimum necessary for passing the course.

Honor Points

The grade *A* gives 4 points; the grade *B*, 3 points; the grade *C*, 2 points; the grade *F*, 0 points.

Delayed Grade

A delayed grade may be recorded when the student's work is incomplete but otherwise worthy of credit, or when the instructor feels unable to assign a grade at the end of the semester. The student must finish this work within the next two semesters of residence or receive an *F*. This last rule does not apply to course numbers 400, 450, or 490.

Scholastic Standing

The grade point average in the Graduate School is based on the student's entire

graduate record in courses numbered 200 and above taken at UMC. To remain in good standing, a graduate student must maintain a cumulative grade point average of 3.0 or better. For graduation, the student must earn *A* or *B* grades in at least 75 per cent of the hours completed in courses numbered 200 and above carried for graduate credit.

Probation

At the end of any semester, a graduate student whose grade point average is below 2.75 will be placed on probation. If, at the end of the following semester, his cumulative grade point average is 2.75 or better, he will be removed from probation. A student on probation who fails to raise his cumulative grade point average to 2.75 may be allowed a second and final probationary semester on the recommendation of his department or area. A student is subject to dismissal if he fails to raise his cumulative grade point average to 2.75 by the end of a second probationary semester or at any time that his semester or cumulative grade point average falls below 2.0.

Withdrawal from UMC

Formal withdrawal from UMC is arranged through the Graduate Office, 205 Jesse Hall. Students who leave the Columbia Campus without filing a statement of formal withdrawal are given a failing grade of *F* in all courses. If the reason for withdrawal is so urgent that the student cannot obtain an official withdrawal, he should notify the Graduate Dean as soon as possible and officially request to be withdrawn.

An excused grade may be recorded for the student making a *C* at the time of withdrawal. If he is making a grade of *F* at this time a grade of *F* will be recorded.

It is the responsibility of the student to notify his instructors of his intention to withdraw and to determine if his work qualifies him for an excused grade.

Withdrawal to Enter the Armed Forces

If a student is forced to withdraw for the purpose of entering the armed forces of the United States and has been enrolled

for three-fourths or more of the term, he may receive full credit in those courses in which he was making a grade of C or better, provided he has covered the essentials of such courses and submits written proof of immediate induction. *F* grades will be recorded as excused.

MASUA Traveling Scholars

The Mid-America State University Association, of which UMC is a member, sponsors a traveling scholar program in which advanced doctoral candidates may spend a term of study at another MASUA university.

Under the program, doctoral students may cross state and institutional lines for work in highly specialized areas at neighboring campuses while paying fees, registering, and receiving credit at their

home universities. The program would be available for generally one semester.

In this program, UMC cooperates with the University of Kansas, Kansas State University, Oklahoma State University, the University of Oklahoma, Iowa State University, and the University of Nebraska.

To participate in the program, a student would first make certain that resources in which he is interested are not available on his home campus. Then he would request permission from his graduate adviser to spend a semester on another campus where the resource exists. Arrangements would then be made by the adviser with a counterpart professor at the host university, followed by application for approval to the administrative office on each campus designated to handle such applications.

REGULATIONS FOR MASTER'S DEGREE PROGRAMS

The University of Missouri-Columbia confers the Master of Art, Master of Science, Master of Arts for Teachers, Master of Science for Teachers, Master of Business Administration, Master of Education, and Master of Music degrees. Regulations common to these degrees are given in this section while those regulations special to each degree are given in the section following this.

Each department or area has its own requirements in addition to the general ones given in this and the following sections. (For further information, see the alphabetical listings by fields of study in this bulletin.) It is the responsibility of the student to make certain he has satisfied these departmental or area requirements as well as the general regulations for Master's degrees and those special requirements of the particular Master's degree sought.

Candidacy

In order to become a candidate for a Master's degree the following steps are necessary:

(1) *Admission*—A student who intends to become a candidate for a Master's degree must be first admitted to Graduate School. In order to be accepted for admission, the student must give evidence that he has completed an undergraduate course of study such as is offered by colleges of good standing and that he has received a baccalaureate degree equivalent to the baccalaureate degree of the University of Missouri.

(2) *Acceptance for Advisement*—The departmental or area acceptance of the student for advisement is based upon his prior academic record, scores on Graduate Record Examination or other tests, and letters of recommendation, as prescribed by the department or area of interest.

(3) *Selection of Adviser*—With the consent of the professor involved, the student must select an adviser from faculty members of the department or area in which he is doing his major work. Prior to the date of each semester's registration, the

student should consult with his adviser regarding his program of courses.

(4) *Formal Application*—The student may present his application for a Master's degree after he has done satisfactory work for the first half of the first semester or after one summer session. He is encouraged to file this "Application for the Master's Degree" soon after he becomes eligible and he *must* file not later than the session preceding the session in which he expects to receive his degree.

The student should complete this form with the aid of his adviser (and minor adviser if a minor is offered) and be signed by the student, his adviser, and the Director of Graduate Studies before presentation to the Graduate Office for the Dean's approval. The course of study as outlined for the student's graduate program on these application for degree forms may be revised only by a letter from the student's adviser to the Graduate Dean. *No course may ever be removed from the program after the course has been taken.*

Course of Study

A minimum of 30 hours selected from courses receiving graduate credit must be completed for the Master's degree. (Several Master's degrees require more than 30 hours. See section on Special Regulations for Master's Degrees.) At least 75 per cent of the student's entire graduate record must be passed with a grade of *A* or *B*.

The course of study for the Master's degree may be chosen from one or more departments provided it constitutes a unified program approved by the major adviser, the departmental Director of Graduate Studies, and the Dean of the Graduate School. A minor need not be offered. If a minor is offered, it must include at least 10 hours of course work, must be approved by an adviser from the minor subject, and shall be included in the final examination.

Requirements of Residence

A student is required to complete 24 hours of advanced study offered by Uni-

versity of Missouri-Columbia faculty. The student should consult with his adviser about work taken off the Columbia Campus. A minimum of 30 hours of study beyond the Bachelor's degree is required for the Master's degree.

Transfer of Credit

Credit may be transferred from other institutions or campuses on the recommendation of the student's adviser and with the approval of the Graduate Dean provided residence requirements are fulfilled.

Correspondence and Extension Center Courses

A total of eight hours may be earned through the University of Missouri Extension Division by correspondence courses or by extension center courses conducted by members of the Graduate Faculty. Credit earned through correspondence or extension at any other campus is *not* accepted by the Graduate School.

Any correspondence courses or extension center courses must have been approved for graduate credit and must be approved for inclusion in the course of study for the Master's degree by the adviser and the Dean of the Graduate School before the courses are taken.

Before graduate work by correspondence may be taken to be applied toward a Master's degree, at least one summer of satisfactory work must be completed in residence at UMC. The exception to the rule is made for men in the armed services who receive, in advance, approval by the adviser for correspondence work before being in residence on the Columbia Campus.

For further information regarding correspondence study, contact Independent Study Department, 514 South Fifth Street, Columbia, Mo. 65201. For information regarding off-campus extension courses, contact the Director of Off-Campus Credit Courses, University Extension Division, Whitten Hall, Columbia, Mo. 65201.

Credit for Research, Problems, Special Investigations and Readings

Credit for research is counted in terms of hours and is included in the minimum

of 30 hours required for the degree. The number of hours of credit that may be allowed for research, problems, special investigations, and special readings may not total more than 12 hours.

Off-Campus Research

A student, upon the recommendation of his adviser and approval by the Dean of the Graduate School, may enroll for off-campus research. The results of off-campus research must ordinarily form part of a thesis presented to the Graduate Faculty in partial fulfillment of the requirements for an advanced degree.

To enroll for off-campus research, a student must have been in residence in the Graduate School at least one full summer term or one semester of part-time work. Candidates for a Master's degree may not register for more than four hours per semester for off-campus research work or three hours maximum in summer term. Total credit allowed for work done away from the campus is eight hours.

Preparation and Submission of the Thesis

The thesis, when required, must demonstrate the student's capacity for research and independent thought and must be his own work.

The student must first have the thesis approved by his major adviser and a second reader from the department. Upon approval by the second reader, the thesis is to be submitted to the Graduate Dean on or before the official deadline date preceding the student's expected graduation. Consult the calendar in this bulletin.

A third reader, from outside the department (and who may be from off the Columbia campus), is appointed by the Graduate Dean. Upon approval of the thesis by the third reader, the thesis is accepted and the Final Examining Committee then will be appointed by the Dean.

The student's committee can recommend that the Thesis Abstract be included in *Dissertation Abstracts*. If so recommended, the student will prepare an abstract of not more than 150 words for this purpose.

A student writing a thesis should obtain from the Graduate Office in Jesse

Hall a copy of the regulations governing the preparation of theses and from his departmental Director of Graduate Studies the departmental requirements for theses.

Final Examination

Each candidate for the Master's degree is required to pass a final examination to demonstrate his mastery of the fundamental principles of the work included in the course of study offered for the degree. A statement signed by three committee members of the examining board must be sent to the Graduate Office stating that the candidate has passed or failed his examination. A student must be enrolled during the semester in which he takes the Final Examination.

Confirming the Graduation Date

During the first six weeks of the semester in which a student expects to complete the course of study outlined on his "Application for a Master's Degree" form, he should check personally with the Graduate Office to make sure that arrangements for his graduation have been completed.

Time Limitation

The program for the Master's degree must be completed within a period of eight years after first post-baccalaureate enrollment. Time spent in the armed services will not be counted against the eight-year completion rule for the Master's degree.

The student must petition the Graduate Dean for any extension of this time limitation. Such petitions must be received in the Graduate Office prior to the expiration of the normal period.

SPECIAL REGULATIONS FOR THE VARIOUS MASTER'S DEGREES

MASTER OF ARTS: This degree is offered in more than 30 fields of study at UMC and represents the successful completion of a unified program of course work designed to provide a high level of broad competence in a discipline. Thirty hours

of graduate credit, including at least 15 hours in courses numbered 400 or above, are required. An M.A. program does not normally include a thesis. See the specific requirements stated by the departments and areas offering this degree in the Fields of Study section of this bulletin.

MASTER OF SCIENCE: This degree is offered in more than 35 fields of study on this campus. The M.S. degree is oriented toward research, and normally a thesis or research paper is required. The program must include 30 hours of graduate credit, with at least 15 hours of these being in courses numbered 400 or above. See specific requirements stated by the departments and areas offering this degree in the Fields of Study section of this bulletin.

MASTER OF SCIENCE—PHYSICAL SCIENCES: This program in the physical sciences is designed for those who wish to prepare to teach more than one science or for those who desire a broader foundation in science before proceeding for the Doctor's degree. No thesis is required. Forty semester hours of graduate credit is required. Thirty-two of the 40 hours are distributed among the departments of physics, chemistry, and mathematics. Eight hours may be elected from other lines of work approved by the candidate's advisers. Eight hours are in courses numbered 400 or above, and not over 3 hours are in seminar courses. This advanced work must be in the fields mentioned above. It is assumed that Math 80 and Math 175, or their equivalent, will be presented for admission to candidacy or will be taken without credit toward the degree. Math 201 or its equivalent will be presented for admission or will be included in the program for the degree.

MASTER OF EDUCATION: As distinguished from the Master of Arts in Education, this degree does not emphasize research. It is designed to prepare professional educators at a broad level of competence, and requires a minimum of 32 hours of graduate courses, 16 hours of which must consist of courses numbered 400 or above. Further details are listed under Education in the Fields of Study section of this bulletin.

MASTER OF BUSINESS ADMINISTRATION: This degree provides advanced professional training in finance, management, and marketing for persons preparing for careers in business. Fifty-nine hours of graduate work, including at least 24 hours of courses numbered 400 or above, are normally required, although part of this requirement may be waived for students having the proper undergraduate background. For further details, see Business Administration in the Fields of Study section in this bulletin.

MASTER OF MUSIC: This degree represents an advanced level in achievement in applied music. Thirty-two hours of graduate work, including at least 16 hours in courses numbered 400 or above, are required, and all candidates for this degree must give a recital. For further details, see Music in the Fields of Study section in this bulletin.

MASTER OF ARTS FOR TEACHERS: This degree is offered by the departments of Classical Studies and Romance Languages in the areas of Latin, French, and Spanish. The program is planned to meet the needs of the secondary school teacher in the classroom by improving his knowledge of the language and methods of teaching it. It differs from the Master of Arts programs in these departments which are intended to train scholars in literature and linguistics. For this reason, the M.A.T. degree does not constitute a step toward the Doctor of Philosophy degree; however, some of the work required for the program would be applicable to the Ph.D. degree if the candidate should later elect a scholarly career. Admission to the program requires an undergraduate concentration in one language satisfactory to the department concerned, and a teaching certificate. The program requires the completion of at least one course on the 400 level. No thesis is necessary. Other specific requirements may be obtained from the department concerned.

MASTER OF SCIENCE FOR TEACHERS: This degree is designed to strengthen the subject matter competence for high school teachers in those sciences commonly taught in the nation's high schools. It is not intended to qualify the recipient for a junior college or college teaching position, nor

will it count as a full year's work toward the Doctor's degree. At least 24 semester hours of acceptable credit in college level sciences and a teaching certificate are required for admission to this degree program. This degree is offered in the areas of biology (botany and zoology), mathematics, physical science (physics, chemistry, and geology), and economics, and requires 32 hours of graduate work, including one 400-level course in the area. Only subject matter courses can be used to satisfy the requirement, although the program is quite flexible in order to meet the needs of individual students.

Area Programs

In addition to the departmental Master's programs, Master's degrees are offered in the following areas: linguistics, laboratory animal medicine, sanitary science, and South Asian language area. These are described in the area programs in the Fields of Study section of this bulletin.

Dual Degree Programs for Medical Students

MASTER'S-M.D.: This program utilizes the flexibility of the medical curriculum to enable a medical student to pursue and receive a master's degree in an area of his choice within the 4-year span of enrollment in medical school.

The objective of this program is to allow interested qualified students to seek in depth involvement in disciplines of their choice based upon their future role and earlier background and interests. Master's programs are available in all the basic sciences and public health in the School of Medicine and in the various other disciplines throughout the campus including science, humanities, engineering, agriculture, journalism, and the arts.

Financial support may be provided for the graduate portion of the dual degree program.

M.D.-PH.D.: This is a six-year program for the student seeking a bio-medical research career. After acceptance into medical school, students must be accepted by the graduate program of their choice. Two additional years are to be worked into the medical

curriculum to satisfy requirements for the Ph.D. This is usually accomplished by a post-sophomore year and a post-M.D. year.

Ph.D. programs are available in anatomy, biochemistry, microbiology, nutrition, pharmacology, physiology, psychology, pathology, and medical sociology with School of Medicine faculty and in various

other disciplines of other colleges and divisions of the campus.

Fellowship support may be provided for the Ph.D. portion of this program while loan and scholarship funds may be available for the M.D. curriculum based on need.

Inquiries should be made in the office of the Dean of Medicine.

uate Dean an Advisory Committee consisting of at least five members. The Advisory Committee may administer a Qualifying Examination if it is deemed desirable and is charged with planning the doctoral program with the student.

The purpose of the Qualifying Examination is to help in assessing the general background of the student and his prospects for the Ed.D. degree. The examination is also used as information in planning the student's program.

Program of Study

After successfully completing the Qualifying Examination (if required), the student's program of study is determined by the major adviser in cooperation with the Advisory Committee. The program shall constitute a well-organized plan of professional specialization in one of the major fields of education with one or more supporting fields. A minimum of 82 semester hours of work above the Bachelor's degree is required for the degree of Doctor of Education.

Off-Campus Research

To enroll for off-campus research, a student must have been in residence in the Graduate School at least one full summer term or one semester of part-time work. Candidates for a Master's degree may not register for more than four hours per semester for off-campus research work or three hours maximum in summer session. Total credit allowed for work done away from the campus is eight hours.

Matriculation Examination

When the student's adviser deems that the student has completed the needed course work in his professional area of specialization, the Advisory Committee is called together to plan the pattern of the matriculation examination. The examination is a comprehensive one, including the candidate's major fields of interest for the degree and is conducted by the major adviser and advisory committee. It is comprised of both a written and an oral component. This examination must be taken no earlier than the second year of graduate work.

Before being admitted to the matriculation examination, the candidate is required to give satisfactory evidence of sufficient knowledge of statistics and educational research techniques as to enable him to understand and utilize research reports in the field of education. To satisfy this requirement the student shall have earned credit (or its equivalent) in courses in Educational Statistics, Advanced Educational Statistics, and Methods of Educational Research. Acquaintance with foreign languages will not be required except as may be determined by the candidate's major adviser.

The matriculation examination must be completed at least seven months before the Final Oral Examination—by October 15 for May Commencement, by December 15 for Summer Commencement, and by June 17 for mid-year Commencement. (See Graduate School Calendar.)

Passing. A candidate will be considered to have passed the matriculation examination if all or all but one of the Advisory Committee vote that he pass. If failure is reported, the Committee will recommend suggested work or other remedial measures.

The candidate who has failed to pass may not take a second examination until at least 12 weeks have elapsed. Failure on two matriculation examinations shall automatically terminate candidacy at UMC.

Dissertation

A dissertation is required, for which not less than 8 hours of credit may be granted. There is no maximum credit restriction for the dissertation providing that more than 70 graduate hours of other approved courses are completed and granted toward the Doctor of Education degree. The dissertation must be reviewed and approved by the candidate's Advisory Committee. (See section on Regulations for Doctoral Degrees.)

Final Examination

A final oral examination on the work included in the dissertation is also required. This is conducted by the adviser and the Advisory Committee.

The candidate must be enrolled for this examination. The examination cannot be taken when UMC is not officially in session.

GRADUATE ASSISTANTSHIPS, FELLOWSHIPS, SCHOLARSHIPS

Graduate fellowships and scholarships are limited to students of outstanding ability who have completed, or expect to complete before the opening of the next academic year, the requirements for a Bachelor's degree.

Applications for all fellowships and scholarships must be filed in the departmental offices not later than March 1 in order to receive consideration for the following year. Fellowships or traineeships administered by the Graduate School must be accompanied by Graduate Record Examination or other comparable scores. GRE advanced tests are required in appropriate academic areas.

Assistantships

Over 1,300 graduate teaching and research assistantships in various departments and areas are available to graduate students. Stipends for nine-month appointments start at \$2,800 and increase accordingly.

A graduate assistant, normally on a half-time appointment, may take a maximum of 12 hours of course work. Holders of graduate assistantships are required to pay fees. Some summer assistantships are available. Applications for graduate assistantships should be made directly to the Chairman or Director of Graduate Studies in the department or area in which the student intends to work.

Residence Hall Assistantships pay a minimum of \$100 per month plus room and board for graduate students living in residence halls and giving academic assistance to undergraduates. Positions as personnel assistants and head residents are also available to qualified graduate students. Applications are available from the Housing Office, 123 Jesse Hall.

NON-DEPARTMENTAL FELLOWSHIPS AND SCHOLARSHIPS ADMINISTERED BY THE GRADUATE OFFICE

UNIVERSITY GRADUATE FELLOWSHIPS are available in blocks to various departments. The fellowships complement or

supplement appointments as graduate research assistants or graduate teaching assistants. Some summer awards are also available. Apply to the departmental director of graduate studies for details. Deadlines vary by the departments, but in general fall on March 1.

UNIVERSITY SUMMER FELLOWSHIPS for Teaching Assistants are available to graduate assistants who have been teaching at least half-time for both semesters of the preceding year, who have earned at least 12 hours of graduate credit during the preceding year, and who have demonstrated superior scholarship. The summer fellowships carry stipends of \$600 plus an allowance for fees. Application is made through the various departments by April 1.

GREGORY FELLOWSHIPS currently provide stipends of \$2,200 for the academic year and are used primarily for dissertation fellowships. Holders of Gregory Fellowships are allowed to engage in outside work with the consent of the Dean of the Graduate School and of their adviser. Deadline for filing is April 1.

NDEA GRADUATE FELLOWSHIPS, from the Office of Education, are financed through Title IV of the National Defense Education Act of 1958. This program assists students who are preparing for college and university teaching. Each fellowship is for a three-year period and is restricted to citizens or permanent residents of the United States who are pursuing doctoral work in specific academic areas. Students with less than two years of graduate work are eligible for three-year awards. The stipend is \$2,400 for the first year, \$2,600 for the second, \$2,800 for the third, plus an allowance of \$500 for each dependent. These fellowships also cover fees. A holder of an NDEA Title IV fellowship is expected to teach part-time during his second and third years. Application is made through the departmental directors of graduate studies.

NDFL FELLOWSHIPS are financed through Title VI (Modern Foreign Languages) of the National Defense Education Act. UMC participates in programs

of the South Asian Language and Area Studies. These fellowships, restricted to citizens or permanent residents of the United States, are intended for students planning careers in college or university teaching or in area language problems. The stipend for the fellowship, which is renewable, is \$2,250 for the academic year or \$2,700 for the summer and academic year, plus an allowance for dependents. Title VI fellowships also provide for the payment of fees. Apply through the South Asian Center by April 15.

EPDA FELLOWSHIPS are funded through the Education Professions Development Act, Title V, Part E of the Higher Education Act of 1965. Two-year fellowships are available which lead to a master's degree in participating academic areas and to the Certificate of Specialization in junior college teaching. Stipends are \$2,400 for the first 12-month period and \$2,600 for the second, with a \$500 allowance for each dependent. EPDA fellows combine work in academic areas with courses and a continuing seminar in higher education. Part of the two-year fellowship period is devoted to an internship at a junior college. Apply through the departmental directors of graduate studies by April 1.

GRADUATE DISSERTATION FELLOWSHIPS are supported by the Graduate School to cover small research expenses and some necessary travel in connection with research. Applications are considered on a continuing basis during the academic year. Limited support is also available for attendance at scholarly meetings on a selected basis. Application forms are available in the Graduate School Office.

POST-RESIDENCE DOCTORAL FELLOWSHIPS are available for students who, having passed the Comprehensive (or Matriculation) Examination, are engaged in full-time research. (For details see sub-section entitled "Continuing Registration" in Regulations for the Doctoral Degrees.)

CURATORS FALL AND WINTER SCHOLARSHIPS for Members of Faculties of Missouri Colleges are available to full-time faculty members of accredited junior colleges and four-year colleges in Missouri. The stipend for these scholarships is equivalent to the incidental fee. Applicants are required to devote full time to

graduate work leading to an advanced degree. These scholarships are available for each academic year; awards are made on a competitive basis. Application forms may be obtained from the President or Dean of each eligible institution; deadline for filing is July 1.

CURATORS SUMMER SESSION SCHOLARSHIPS for Members of Faculties of Missouri Colleges are available to faculty members of the colleges mentioned above. These summer session awards are in the amount of the incidental fee; recipients must register for six credit hours. Application forms may be obtained from the President or Dean of each eligible institution; deadline for filing is May 1.

CURATORS SCHOLARSHIPS for Honor Graduates of Missouri Colleges are equal to the incidental fee for the first two semesters of the school year immediately following the student's graduation from college. The award is made to the student attaining the highest scholastic rank in the graduating class; academic rank may be determined after seven semesters of course work. The following fully accredited Missouri schools and colleges are eligible: Avila College, Cardinal Glennon College, Central Methodist College, Central Missouri State College, Culver-Stockton College, Drury College, Evangel College, Fontbonne College, Harris Teachers College, Kansas City Art Institute, Lincoln University, Lindenwood College, Marillac College, Missouri Southern College, Missouri Valley College, Northeast Missouri State College, Northwest Missouri State College, Park College, Rockhurst College, School of the Ozarks, Southeast Missouri State College, Southwest Baptist College, Southwest Missouri State College, Stephens College, Tarkio College, Webster College, Westminster College, William Jewell College, William Woods College. In the event that the first-ranking graduate fails to accept the scholarship, it may become available for the graduate who stands second; or eventually for the one who stands third, but no lower. Certification of the student's attainment is to be made by the proper official of the institution to the Dean of the Graduate School. Deadline for receipt of nominations is August 1; however, earlier nominations are encouraged.

CURATORS GRANT-IN-AID to Foreign Graduate Students and Displaced Persons are limited in number and are open to campus-wide competition. The grants-in-aid are equal to the amount of the incidental fee for one academic year. Application blanks and detailed information may be obtained from the Foreign Student Adviser. Deadline for fall semester applications is March 15.

DEPARTMENTAL FELLOWSHIPS, SCHOLARSHIPS, AND PRIZES

The awards listed below are administered by the individual departments; application should be made directly to the department chairman or director of graduate studies. Most awards are restricted to those majoring in the particular department and are based on scholarship. Generally, the deadline for application is March 15.

ACCOUNTANCY: Alumni with Arthur Andersen & Co.—variable awards; Alumni with Elmer Fox & Co.—variable awards; Ernst & Ernst—variable awards; Haskins & Sells Foundation—\$2,500; Monsanto Co.—variable awards; The Peat, Marwick, Mitchell Foundation—variable awards; Price Waterhouse Foundation—variable awards; Touche Ross Foundation—variable awards; John Paul Williams Scholarship—\$300; Williams, Keepers, Oliver, Payne & Rackers—\$300 to Missouri resident; Arthur Young Foundation—variable awards.

AGRICULTURE: Charles Kiepe—\$2,200 campus-wide competition as for the Gregory Fellowship. William Henry Hatch Fellowship—\$4,600 (for first year) and \$4,800 (for second year) to a doctoral candidate supervised by a department in the College of Agriculture. George W. Carver Fellowship—\$4,600 (for first year) and \$4,800 (for second year) to a Negro graduate student supervised by a department in the College of Agriculture.

ART HISTORY AND ARCHAEOLOGY: Kress—\$3,000 and \$2,000 and renewable; Ford Foundation—for transportation to and living costs at excavation sites away from the campus.

BASIC MEDICAL SCIENCE: Medical Center Graduate Pre-doctoral Fellowship—student stipend plus tuition and fees.

BOTANY: Ernest J. Palmer Memorial—\$400 for cataloging and caring for Palmer collections of rocks and minerals.

BUSINESS ADMINISTRATION: Independent Natural Gas Association of America—\$2,500 annually to students participating in the business communications program; Missouri Association of Independent Insurance Agents—\$500 annually to a student preparing for a career in the Insurance industry; Missouri Bankers Association—\$2,500 annually to a graduate of

a college or university in Missouri to pursue a Master's degree with concentration in banking and finance; Missouri Educational Foundation—\$500 annually to a student interested in advanced study of administration; Missouri Savings and Loan Association—\$500 annually to a student interested in study of real estate and savings and loan institutions; Purchasing Managers Association of St. Louis—\$500 annually to a student pursuing study of industrial purchasing.

CHEMICAL ENGINEERING: Shell Oil Foundation—\$3,350 plus project expenses; Summer Shell Foundation—\$650; Texaco Company—\$2,500; Monsanto Company—\$2,000; Marathon Oil Company—\$2,000; American Oil Company Foundation—\$3,000; Esso Research and Engineering Foundation—\$2,500 and Atlantic Richfield—\$2,500.

CHEMISTRY: Shell Oil Company—\$3,350 plus project expenses; Summer Shell Oil Company—\$650.

CIVIL ENGINEERING: Associated General Contractors of Missouri—\$700 to a graduate student in the field of construction management (Missouri resident).

CLASSICAL STUDIES AND ARCHAEOLOGY: Walter Miller Classical—\$1,200 to a graduate student interested in an M.A. or Ph.D. in Classical Languages.

ECONOMICS: Peabody—income of \$6,000 awarded on the same basis as the Gregory Fellowship.

EDUCATION: Rehabilitation Services Administration Traineeships—offered at four levels; Level I—\$1,800 (two semesters); Level II—\$2,000 (two semesters); Level III—\$2,800 (two semesters); Level IV—\$3,400 (two semesters); includes fees, plus \$500 per dependent at Levels III and IV. E. M. Carter Memorial—\$100 to a Missouri graduate student in education on the basis of need, superior scholarship and professional promise as a teacher.

ENGLISH: Teaching Fellowships—\$2,350 to \$4,500, teaching in English; Fidelity Education Foundation—\$100 for best original piece of research in English.

ENTOMOLOGY: Leonard Haseman—\$100 (2) sincere interest in Entomology.

FOOD SCIENCE: Eugene V. Nay—\$250 award to the outstanding M.S. or Ph.D. in Food Science.

GEOLOGY: A. P. Green Company—\$2,000 plus \$200 for travel to a male candidate for the Master's or Doctoral degree working on a problem involving clay; W. A. Tarr Memorial—\$300 to a worthy candidate in mineralogy or economic Geology; Ernest Palmer Memorial—\$300 to a student in Paleontology; M. G. Mehl Memorial—award to a graduate student for research in paleontology-stratigraphy; Chevron Oil Company—\$500 to outstanding senior in Geology.

HEALTH SERVICES MANAGEMENT: Foster G. McGaw Scholarship—\$1,000 to first-year graduate student in Health Services Management.

HISTORY: Frank F. and Louise I. Stephens History Scholarship—approximately \$1,300; Allen Cook White, Jr. Fellowship—approximately \$700; Norman Maclaren Trenholme History Scholarship; Jonas and Ruth H. Viles Scholarship—approximately \$200—outstanding graduate student in American History; Lewis E. Atherton Research Fund—grants to history graduate students

to aid in dissertation research; Floyd Calvin Shoemaker Fund—grants to graduate students in history to aid in research on Missouri History; Fidelity Educational Foundation Scholarship in History—approximately \$200—outstanding sophomore or junior majoring in history.

JOURNALISM: Frank Luther Mott Fellowship—\$2,500 to a Master's candidate in magazine journalism; the Frank Luther Mott Historical Research Graduate Scholarship—\$1,000 to a student whose thesis topic involved historical research; Frank H. Scott Award—\$100 to a student in Journalism for best Master's thesis; Morris E. Jacobs—\$500 for Master's candidate; Walter Williams Memorial Fellowship in International Press Problems—about \$800—must have a Master of Arts degree in Journalism and have passed language examinations and be proceeding for the Doctor of Philosophy degree.

LIBRARY SCIENCE: Ruth Tandy Roysse Fellowship in Library Science—an award of \$500, donated by Mrs. Ruth Tandy Roysse of St. Louis, is made annually to a graduate student in library science, on the basis of academic record, potential for development as a librarian, and financial need. Preference is given to a student who has completed a Bachelor's degree at UMC, with an area of concentration in library science. Applications should be made before March 1 to the Dean of the School of Library and Informational Science.

MECHANICAL AND AEROSPACE ENGINEERING: Procter & Gamble Company—\$4,500 to a graduate student in Mechanical & Aerospace Engineering plus project expenses.

NURSING: Department of Health, Education and Welfare Public Health Service Traineeships—fees and tuition plus living allowance of from \$250 to \$350 per month (depending on experience) and dependency allowance. Must be a citizen of United States.

PHYSICAL CHEMISTRY: Gulf Fellowship—\$2,500.

PHYSICS: Eisenstein Prize—\$50 at Spring Commencement to the outstanding graduate student in Physics; Harry E. Hammond Prize—\$50 to the graduate student who has made the most significant contribution to undergraduate teaching programs in Physics; O. M. Stewart—\$2,200 for Physics majors.

POLITICAL SCIENCE: Congressional Fellowships—\$4,500 awarded to a graduate student in Political Science who has substantially completed on-campus requirements for the doctoral degree, recipient will be assigned to the office of one of the members of the Missouri delegation in Congress and, where possible, will be attached to the fellowship group sponsored by the American Political Science Association in Washington, D.C.

PSYCHOLOGY: Fidelity Education Foundation—\$100 recipient is recommended by the faculty of the animal learning laboratory of the Department of Psychology on the basis of demonstrated excellence in experimental research in the field of animal learning.

RECREATION AND PARK ADMINISTRATION: Missouri Park and Recreation Association—\$50 to \$300 (approximately 10) to undergraduate and graduate students majoring in Recreation.

ROMANCE LANGUAGES: Jacob Warshaw—\$50 to outstanding student who has maintained a high scholastic record in Spanish or Portuguese and who will agree to continue a study of that language at UMC.

SOCIAL WORK: Rehabilitation Services Administration Traineeships—offered at two levels: Level I—\$1,800 (two semesters); Level II—\$2,000 (two semesters) includes fees, plus \$375 per dependent at both levels. NIMH Corrections—offered at two levels; Level I—\$1,800 (two semesters); Level II—\$1,953 (two semesters) plus fees and \$375 per dependent at both levels. NIMH Aging—offered at two levels: Level I—\$1,800 (two semesters); Level II—\$1,953 (two semesters) includes fees, plus \$375 per dependent at both levels. NIMH Psychiatric Medical—offered at two levels: Level I—\$1,800 (two semesters); Level II—\$1,953 (two semesters) includes fees, plus \$375 per dependent at both levels. Child Welfare Training Grant—offered at two levels: Level I—\$1,800 (two semesters) plus fees and dependency allowances of \$357 per dependent; Level II—\$1,953 (two semesters) plus fees and \$378 per dependent.

SOCIOLOGY: Social Psychology Fellowships—\$2,400 up to \$4,200 for 12 months plus \$600 for each eligible dependent, awarded to students in social psychology by the Social Psychology Training Committee on a competitive basis; Manpower Fellowships—\$3,200 for nine months for a single person to \$4,300 for a person with three dependents, awarded competitively by the Manpower Steering Committee; Medical Sociology Traineeships—\$3,000 to \$4,200 for 12 months plus \$600 for each eligible dependent, awarded on the basis of academic excellence and commitment to health-oriented interests by the Department as recommended by the Medical Sociology Committee.

ZOOLOGY: Wildlife Conservation, Edward K. Love—\$2,800 (4) plus provision for field expenses; E. Sydney Stephens Memorial—\$2,800 to a student in the field of fishery biology; Winterton Conway Curtis and Jonas Viles—two scholarships for aid for study at the Marine Biological Laboratory, Woods Hole, Massachusetts; Rudolf Bennitt—\$2,800 to a student in the field of fishery biology.



LIVING ACCOMMODATIONS

Graduate students are permitted to reside in such housing as they may select.

University-owned Housing. University of Missouri-Columbia residence halls are available for both men and women students. All accommodations include room and board. UMC has one-bedroom and two-bedroom apartments available for married students. Application blanks and additional information may be obtained by writing to the Housing Office, 123 Jesse Hall.

Privately-owned Dormitories. Residence hall accommodations for single men and women are available in the Mark Twain Residence Hall. This privately-owned building is air-conditioned and equipped with semi-private baths. The current charge for room and board is \$1,425 for the academic year. For further details, write directly to the Mark Twain Residence Hall, 515 South Fifth Street, Columbia, Missouri 65201.

Room and board for graduate men students may be obtained at Gamma Alpha Graduate Science Society, which maintains a house near the campus at 1419 Wilson Avenue. For information, write directly to the Society.

The UMC Housing Office maintains a listing of available rooms and apartments in off-campus housing facilities. However, the Housing Office does not serve as a rental agency for these accommodations. Although some students are able to complete arrangements with householders by mail, most students find that a trip to Columbia well in advance of the date housing is required will aid them in making more satisfactory arrangements for off-campus housing. For this reason and because lists of available accommodations in off-housing are frequently amended, the lists are not made available by mail.

MEDICAL SERVICE

A student's health has an important relationship to his ability to profit from and progress in his total educational endeavor. If a student is ill, incapacitated by accident, or in generally poor health,

he will be unable to study, attend class, and learn as effectively as he otherwise would. Consequently the University offers a two-part health program consisting of (1) a Student Health Service and (2) a supplementary sickness and accident insurance policy.

Medical Examination. A complete medical examination, performed by a licensed physician, is required of all new students, full-time and part-time, prior to enrollment. This requirement includes a Report of Medical History and a Report of Medical Examination (may be obtained from the Director of Admissions). No exemption is permitted. Any delay in accomplishing this may result in a delay in enrollment or, in certain instances, suspension or required withdrawal from UMC. In addition, a smallpox vaccination, tuberculin test, and a urine test are required. It is advisable to have these done at the time of your medical examination. If this is not feasible, they will be done by the Student Health Service during registration period.

The Report of Medical History and Medical Examination form may be obtained from the Director of Admissions.

Services Rendered. All students in residence at the University of Missouri-Columbia are entitled to Student Health Service care at no cost. This medical service will be provided only at the Student Health Center, located between the Francis Quadrangle and South Sixth Street, and consists of outpatient medical care, including the Mental Hygiene Clinic, infirmary care (including consultative services in the infirmary) and the usual ancillary services, such as laboratory, X-ray, physical therapy, and pharmacy. Infirmary care, for full-time or part-time students, is limited to 30 days per semester, 15 days per summer session, and 7 days per inter-session. Medical care, both outpatient and inpatient, is provided at the Student Health Center for the usual and ordinary illness and accident. The services provided are in accordance with established UMC regulations.

Laboratory, X-ray, Physical Therapy and Pharmacy. The extent of services rendered in these areas are within the limits prescribed by the Director of Student Health.

Services Not Rendered. In circumstances where hospitalization or the services of specialist care are required but not provided at the Student Health Center, such hospitalization and medical care rendered will be the responsibility of the student. However, the Student Health Service will assist the student in arranging for these services if so requested by the student.

The following are examples of services not rendered at or by the Student Health Center:

1. Medical service requiring the need for hospital care and specialist care beyond that care rendered by the Student Health Center outpatient and inpatient infirmary service.
2. Major surgery—both emergency and elective.
3. Major fractures and other types of trauma.
4. Any surgical procedure requiring a general anesthetic.
5. Refraction of eyes or fitting of glasses.
6. Dental service.
7. Obstetrical care or complications of pregnancy.
8. Care to chronically ill or disabled students. Supportive treatment will be provided within the resources of the Student Health Service. The student will be assisted and advised as to treatment available elsewhere.
9. House calls. Student Health Service physicians do not make calls to students' rooms. A student who wishes to remain in his room during an illness must employ a private physician at his own expense. However, students who are ill are not permitted to remain in the UMC residence halls.

Supplemental Sickness and Accident Insurance Plan. This plan, sponsored by the University of Missouri, is obtainable at an extremely low cost and will for the most part cover the student's needs for hospitalization, surgery, and consultative services in instances where these are not provided by the Student Health Service. It includes medical and surgical treatment, including accidents, for students while at home over weekends, holidays, and during the summer vacation period. This insurance can be purchased to cover spouse and dependents at an extra cost. Details concerning this plan are available at the Cashier's Office or the Student Health Center. A company representative is present during the registration period.

Mental Health Clinic. The Student Health Service operates a Mental Health Clinic, located on the third floor of the Student

Health Center, which is equipped to provide treatment for emotional problems of adjustment occurring in college life. Appointments may be made directly with the Mental Health Clinic by the student himself or through the Student Health Service.

Detailed information concerning the rules and regulations of the Student Health Service may be found in the UMC "M" Book.

STUDENT ORGANIZATIONS AND SPECIAL SERVICES

Graduate Student Association. Every graduate student is a member of the Graduate Student Association.

The Graduate Student Council consists of representatives elected from each department. Each October a president is elected from the Council.

The main purpose of the Graduate Student Association is to provide for the social and cultural activities of interest to graduate students. Lectures, coffees, readings, dances, music events, and general meetings occur throughout the year. In addition, the association debates issues of interest to graduate education such as the language examinations, representation in faculty committees, and the relevance of graduate programs.

Social Activities. In addition to activities provided by the Graduate Student Association, the Missouri Student Association, and departmental groups, graduate students are encouraged to participate in the Single Faculty Club (if eligible), the Audubon Society, a cycling and hiking organization, and various groups originating in the campus churches.

Graduate Placement. Placement assistance at a number of campus locations is provided for graduate students seeking employment after obtaining their degrees.

The School of Business and Public Administration placement office, 101 B&PA, is of interest to many graduate students in the social sciences and administrative disciplines. Representatives from more than 350 local, national, and international business organizations, as well as state and

national government agencies, visit this office.

The College of Engineering placement office, 103 Engineering, serves students majoring in engineering, chemistry, geology, mathematics, physics, and in other fields.

The Professional Teacher Placement Service, 111 Hill Hall, assists any student seeking academic employment. Approximately 2,000 students and alumni per year are enrolled.

In addition, each department maintains a placement service for its own graduates.

FEES AND EXPENSES

All statements as to fees are by way of announcement only for the school years covered by this Bulletin and are not to be regarded as offers to contract on the basis of those statements, inasmuch as the University expressly reserves the right to change any and all fees and other charges at any time, without any notice being given in advance of such a change.

Time of Payment of Fees. All University fees must be paid at the time of registration as a condition of admission to classes. Students who preregister must pay fees by the announced deadline or the advance registration will be cancelled and the student will be required to register again and pay fees during the regular registration period as indicated on the Columbia Campus calendar. Registration is not complete until all fees are paid.

Personal Checks. Personal checks in payment of fees or other obligations to the University will be accepted only when the amount of the check does not exceed the amount due from the student. A student who presents a check to the University in payment of student fees, which for any reason is not honored by the bank upon which it is drawn, will be automatically suspended from the University and will be reinstated only upon payment of the amount of the check and a reinstatement fee of \$5.00.

Additional information regarding fees and expenses is furnished in the University of Missouri-Columbia Bulletin, *General Catalog*, and the *Schedule of Courses*. A pamphlet, *Tuition and Residence Rules*, is avail-

able from the Cashier's Office, 123 Jesse Hall.

INCIDENTAL FEE

All students enrolled in the University are required to pay an Incidental Fee as follows:

For one semester of approximately 16 weeks
(8 or more hours)\$230.00
For one term of 8 weeks (4 or more hours) ... 115.00
For any other sessions not specified above and for partial enrollments, the Incidental Fee shall be calculated at the rate of \$29.00 per credit hour or fraction thereof.

Candidates for an advanced degree who have completed in a previous semester or term all requirements but the final examination and the submission to the graduate faculty of a thesis (if required) and who are not regularly enrolled in the Graduate School, must enroll in the Graduate School before the examination may be given or the thesis read. Such students must enroll for examination for no hours' credit and pay a fee of \$29.00. Students who enroll under this rule are not entitled to Student Health Service benefits.

Pre-payment on Incidental Fee: Students accepted for admission on the Columbia Campus are required to deposit the following pre-payment:

Missouri residents (except School of Law)\$20.00
Non-residents of Missouri and School of Law... 50.00

This payment is non-refundable but may be used as part-payment of fees if the applicant enrolls at the University of Missouri-Columbia within a year following payment.

NON-RESIDENT TUITION

In addition to incidental fees, tuition will be charged any student who is not a Missouri resident at the time of original registration or who has not been a resident for at least one year immediately preceding such registration. Tuition for graduate students is the same as for undergraduate students. However, non-resident graduate students on a 25 per cent full-time equivalent or more appointment or on full-time hourly status, or holding a fellowship which does not include payment of tuition, will not be charged tuition. Non-resident Graduate students who were enrolled in Graduate School in 1969-70 (F69-W70-S70) or

who first matriculated in Graduate School in the Fall of 1970, and who are progressing satisfactorily, shall be entitled to two additional continuous years of residence status beginning the Fall semester 1971.

A prospective graduate student may contact the Graduate School or chairman of the department in which he is interested to determine the fees if he feels either of the above categories apply in his specific case. For further information about fees contact the Cashier's office.

Tuition is free to a student who is a full-time academic or administrative staff member of this University, or is the unmarried minor child or spouse of such staff member. Most other students who are not residents of Missouri are charged tuition, but in some cases non-residents are exempt from tuition or tuition is at a reduced amount, as provided in the detailed *Tuition and Residence Rules*.

It is the duty of each student to register under the proper residence and pay proper tuition fees, and it is his duty to raise the question if there is a possibility that he is subject to such fees.

The Director of Cashiering, 123 Jesse Hall, or the Director of Admissions, 130 Jesse Hall, will furnish, on request, the pamphlet *Tuition and Residence Rules* which covers in detail the various cases.

NON-RESIDENT TUITION CHARGES

REGULAR SEMESTER (16 WEEKS)

Number of Hours Credit	Fee
10 or more hours	\$460.00
9 hours	370.00
8 hours	280.00
7 hours	140.00
1-6 hours inclusive	none

SUMMER SESSION (8 WEEKS)

5 or more hours	230.00
4 hours	120.00
1-3 hours inclusive	none

For any sessions other than those specified, the tuition shall be prorated.

STUDENT ACTIVITIES FEE

Each student registered for resident work on the Columbia Campus is required to pay a Student Activities Fee as follows:

For one semester of approximately 16 weeks (10 or more hours)	\$20.00
For one term of 8 weeks (5 or more hours)	\$10.00

For any other sessions not specified above and for partial enrollments the Student Activities Fee shall be calculated at the rate of \$2.00 per credit hour or fraction thereof.

No additional Student Activities Fee shall be charged if the student is enrolled simultaneously in a session or semester and in a special intersession.

No Student Activities Fee shall be charged during the period beginning with the close of regular summer session and ending with the beginning of the fall registration.

No Student Activities Fee shall be charged if the student is enrolled for courses which are offered off campus or if the student is enrolled in evening courses only.

LATE REGISTRATION FEE

Any student registering after the close of the regular registration period shall pay a late registration fee of \$25.00.

FEE FOR CHANGE IN COURSE

A fee of \$5.00 must be paid for one or more petitions for change in course filed at any one time.



REINSTATEMENT FEE

A student, whose enrollment is terminated for any reason and who later requests readmission within the same semester or term, shall be required to pay a \$5.00 reinstatement fee in addition to regular fees.

TRANSCRIPT FEE

A fee of \$1.00 is charged for each official transcript of credits. A fee of 50 cents is charged for all photostatic copies of credits.

FEEs FOR THESIS OR DISSERTATION

The following fees are charged in connection with the submission of a thesis or dissertation:

Master's degree: \$2.00 thesis binding fee; \$3.00 micro-filming fee.
Doctor's degree: \$30.00 doctor's dissertation, microfilming, and binding fee.

EXPENSES

Each student will need to estimate his own individual needs for clothing, transportation, and personal expenses. The other basic costs for one semester for an unmarried graduate student are estimated as follows:

Incidental Fee	\$230.00
Student Activities Fee	20.00
Room and Board in a UMC Residence Hall ...	470.00
Books and academic supplies (estimate)	90.00
Total for one semester	\$810.00
Tuition (see Non-Resident section)	\$460.00



Departments

Accountancy
Agricultural Chemistry
Agricultural Economics
Agricultural Engineering
Agronomy
 Crop Science/Soil Science
Anatomy
Animal Husbandry
Anthropology
Art
Art History and Archaeology
Atmospheric Science
Biochemistry
Biological Sciences
 Botany
 Genetics
 Zoology
 Wildlife Conservation
Chemical Engineering
Chemistry
Civil Engineering
Classical Studies
Community Health and Medical Practice
Dairy Husbandry
Economics
Education
Electrical Engineering
English
Entomology
Extension Education
Finance
Food Science and Nutrition
Forestry
Geography
Geology

Germanic and Slavic Languages
History
Home Economics
Horticulture
Industrial Engineering
Journalism
Library Science
Management
Marketing
Mathematics
Mechanical and Aerospace Engineering
Microbiology
Music
Nursing
Pathology
Pharmacology
Philosophy
Physics
Physiology
Plant Pathology
Political Science
Poultry Husbandry
Psychology
Recreation and Park Administration
Regional and Community Affairs
Romance Languages
Social Work
Sociology and Rural Sociology
Speech and Dramatic Art
Statistics
Veterinary Anatomy
Veterinary Medicine and Surgery
Veterinary Microbiology
Veterinary Pathology
Veterinary Physiology and Pharmacology



Fields of Study

ACCOUNTANCY

JOSEPH A. SILVOSO, Ph.D., University of Missouri-Columbia. CPA; Chairman and Director of Graduate Studies; Prof.

WILBER C. HASEMAN, Ph.D., Syracuse University. Coordinator of Doctoral Programs; Prof.

ROBERT L. KVAM, Ph.D., Louisiana State University. CPA; Coordinator of Masters Programs; Prof.

ROYAL D.M. BAUER, M.B.A., Northwestern University. CPA; Prof. Emeritus

PAUL A. KOHLER, Ph.D., University of Iowa. Prof.

EUGENE L. ZIEHA, Ph.D., University of Illinois. Prof.

ROBERT C. CULPEPPER, Ph.D., University of Arkansas. CPA; Assoc. Prof.

N. ALLEN FORD, Ph.D., University of Arkansas. Assoc. Prof.

DON C. MARSHALL, Ph.D., Louisiana State University. CPA; Assoc. Prof.

RALPH E. SKELLY, Ph.D., University of Alabama. Assoc. Prof.

RAYMOND C. DOCKWEILER, Ph.D., University of Illinois. CPA; Asst. Prof.

ERNEST L. ENKE, Ph.D., University of Illinois. CPA; Asst. Prof.

DONALD R. NICHOLS, Ph.D., University of Oklahoma. Asst. Prof.

JAMES E. PARKER, Ph.D., Michigan State University. CPA; Asst. Prof.

ALFRED R. ROBERTS, Ph.D., University of Alabama. Asst. Prof.

MICHAEL J. SCANLAN, A.M., University of Missouri-Columbia. Asst. Prof.

JAMES C. STALLMAN, Ph.D., University of Illinois. Asst. Prof.

The Department of Accountancy offers graduate work leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. Graduate programs in Accountancy prepare students for accounting research, college teaching, and other advanced professional careers in accounting.

The Department views the field of accounting as a changing one and one that will keep on changing with the increased use of computers, with advancements in information and communication technology, and with the growing complexities in the free-enterprise economic system. Being alert to the fact of change and to the changes, and being intent that accounting education at the graduate level should be somewhat ahead of current practice, the Department offers course-work stressing

advanced knowledge in data processing, quantitative methods, economics, and business.

Special facilities for accounting study and research include the Research Center of the School of Business and Public Administration, which provides facilities and support for research projects in cooperation with business groups and government agencies, and the Computer Center with extensive taped computer programs and banks of operating data adaptable to accounting research, including the COMPU-STAT service of Standard Statistics Company (computer-taped financial and operating data for 1,000 companies back to 1946 with provision for various cross-classifications).

Other sources of research material are all U.S. accounting technical journals and services, and many from other countries to which the main library subscribes; and micro-card collections of annual reports of all companies listed on the New York Stock Exchange and selected doctoral dissertations in accounting and related fields.

The Department cooperates closely with accountants in government and industry, with national and local CPA firms, and with the professional associations for these groups. Opportunities exist, both on and off the campus, for interchanging ideas with practicing accountants and for participating in the solution of their professional problems.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. These forms of financial assistance are supported by funds donated by state and national government agencies and by various business and public accounting firms and groups. Applications should be submitted by March 1.

For additional information, including an individually prepared tentative program of study and application forms, write the Chairman, Department of Accountancy, School of Business and Public Administration.

MASTER'S DEGREES

The department offers two master's programs. The Master of Arts (M.A.) degree

is designed for students who have an undergraduate degree in business with a major or minor (12 semester hours) in accountancy. The Master of Science (M.S.) degree is limited to those with a baccalaureate degree in a field other than accounting.

The entrance requirements for both the M.A. and the M.S. degrees are based upon the following criteria: (1) a 3.0 or higher overall grade-point average in undergraduate work ($A=4.0$) with consideration given to grade trends, performance in the student's major area, class rank, maturity, experience, and other criteria bearing on a student's probable success in graduate study; (2) acceptable performance on the Admission Test for Graduate Study in Business.

M.A. in Accountancy

The Master of Arts degree in Accountancy combines depth in accounting and data processing with breadth in the related fields of business, economics, and quantitative methods. A student may choose from a number of different programs in consultation with his adviser.

- Program I Data Processing
- Program II General Accounting
- Program III Institutional Accounting
- Program IV Managerial Accounting
- Program V Public Accounting
- Program VI Research and Teaching

To complete requirements for the M. A degree, a candidate must: (1) complete substantially all course requirements for the accountancy undergraduate degree. Courses taken as a graduate student to fulfill undergraduate prerequisites do not carry graduate credit except that a maximum of 9 semester hours of such courses may be counted. Special accelerated courses open only to graduate students are available to satisfy many of these undergraduate prerequisites; (2) complete 30 semester hours of graduate course work including at least 20 hours numbered 400 or higher. Of the thirty hours, at least 12 must be in the Department of Accountancy and at least six in departments other than Accountancy; (3) fulfill one of the approved programs with a grade average of *B* (3.0) or better; (4) pass a comprehensive written and/or oral examination covering the stu-

dent's graduate work; and (5) comply with residence, time limitations, and other matters specified in this bulletin. There is no language requirement; and a thesis, in lieu of 6 hours of course work, is optional.

M.S. in Accountancy

The M.S. degree is a four-semester professional program built around a core of accelerated courses inaugurated specifically for the mature student. The curriculum consists of balanced coverage of the following major areas: Economics; Electronic Data Processing; Law; Organization, Functions, and Problems of Business; Mathematics and Statistics; and Accountancy.

The first year of study consists of foundation courses already coordinated to provide basic concepts, techniques, and analytical thought processes for advanced study of accounting. A foundation course may be waived for a student whose undergraduate record indicates that he has already successfully mastered the equivalent subject matter.

Second-year courses cover the advance educational requirements of the professional accountant or accounting-oriented business manager. They stress the theory and practice of accounting and give balanced consideration to the various accounting areas in their relationship to the organization, functions, and problems of business.

To complete requirements for the M.S. degree, a student must (1) complete the professional program of study with an average grade of *B* (3.0) or better; (2) pass a comprehensive written and/or oral examination covering the student's graduate work; (3) comply with residence, time limitations, and other matters specified in this bulletin. There is no language requirement. No thesis is required.

Ph.D. DEGREE

Acceptance of a student by the Department of Accountancy to commence work on a Ph.D. program is based upon a combination of the following criteria: (1) a 3.0 or higher overall grade point average in undergraduate work ($A=4.0$), and ranking in the upper fifteen per cent of the undergraduate class. Consideration is also

given to class rank, grade trends, experience, maturity, and other factors bearing upon probable success in the program; (2) a 3.0 or higher grade point average in at least 30 hours of graduate work, and ranking in the upper one-third of the graduate class; (3) superior performance on the Admission Test for Graduate Study in Business.

To be admitted to candidacy for a Ph.D. degree in Accountancy, a student must complete the equivalent of the Master of Arts in Accountancy and demonstrate competency in the following areas: accounting, economics, finance, management, marketing, and quantitative methods. Course work equivalent to the Master's degree may be transferred from another institution. Competency will be demonstrated by a written and/or oral qualifying examination conducted by an Advisory Committee.

The program for the degree of Doctor of Philosophy in Accountancy normally requires two years beyond the Master's degree and consists of: (1) a course of study; (2) practical experience in teaching and research; (3) examination over accumulated knowledge in a major and two supporting fields; (4) language, collateral fields or research technique requirements; and (5) demonstration of research and writing ability by completing a doctoral dissertation on an approved research topic.

Under the guidance of an advisory committee, a course of study is individually designed to fit each student's academic background, experience, and objectives. Acceptable work completed in a master's program (or its equivalent) is included. A student's course of study is composed of the following categories: primary field, Accountancy, 18 hours minimum; first supporting field, 12 hours minimum; second supporting field, 12 hours minimum; elective area, 12 hours minimum; and research technique or collateral field, 9 hours minimum.

Supporting fields are selected from behavioral science, data processing, economics, finance, management, marketing, organization theory, public administration, quantitative methods, or other definable areas related to accounting and acceptable to the advisory committee. The elective area is

used to provide breadth and balance in each student's program and generally will include quantitative methods, advanced economics, and behavioral science when these subjects are not reflected in the supporting fields. The research technique or collateral field is designed to enhance the student's research abilities or his understanding of accounting problems in a highly specialized field. Some examples of research techniques are: Mathematics, Statistics, Econometrics, Symbolic Logic, Computer Programming, and Management Science. Some examples of collateral fields are: Government Regulation of Business, Economics, Ethics, Organization Theory, Communication Theory and Information Theory. Other choices are not precluded.

AGRICULTURAL CHEMISTRY

BOYD L. O'DELL, Ph.D., University of Missouri-Columbia. Chairman; Prof.

MILTON S. FEATHER, Ph.D., Purdue University. Director of Graduate Studies; Assoc. Prof.

RICHARD A. BLOOMFIELD, Ph.D., University of Missouri-Columbia. Acting Dean of the Graduate School; Prof.

CHARLES W. GEHRKE, Ph.D., Ohio State University. Prof.

C. EDMUND MARSHALL, Ph.D., London University. Prof.

DENNIS T. MAYER, Ph.D., University of Missouri-Columbia. Prof.

MERLE E. MUHRER, Ph.D., University of Missouri-Columbia. Prof.

E. E. PICKETT, Ph.D., Ohio State University. Prof.

GEORGE B. GARNER, Ph.D., University of Missouri-Columbia. Assoc. Prof.

WALTER A. AUE, Ph.D., University of Vienna. Assoc. Prof.

RICHARD G. COOPER, Ph.D., University of Texas. Asst. Prof.

S. ROY KOIRTYOHANN, Ph.D., University of Missouri-Columbia. Assoc. Prof.

RUSSELL L. LARSON, Ph.D., University of Illinois. Assoc. Prof.

The Department of Agricultural Chemistry offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy. The graduate program is designed to prepare students for teaching and

research careers in the area of Biochemistry. The five areas of concentration are: (1) Analytical Biochemistry, including spectroscopy and trace analysis; (2) Nutritional Biochemistry; (3) Physiological Chemistry; (4) Biochemistry of Natural Products; and (5) Reproductive Biochemistry. Facilities and staff members are available to support research in specialized areas such as enzymology, chemical spectroscopy, nuclear magnetic resonance, chromatography, mass spectrometry, bioassay, hemostasis, carbohydrate chemistry and nitrogen metabolism.

Graduate work is designed to develop independent thought, originality and a broad knowledge in biochemistry. Major emphasis is placed on research participation. A departmental seminar is regularly employed to acquaint students with the broad aspects of current research activity in the area of biochemistry.

The department has, in addition to well-equipped laboratories for biochemical research and animal experimentation, access to the Experiment Station Chemical Laboratories and the Spectrographic Laboratory which are directly associated with the department. These laboratories provide unusually strong capabilities in chemical analysis and analytical research.

An isotope ratio mass spectrometer is available for research using isotopically labeled compounds. For studies in the protein area the department has an analytical ultra-centrifuge and a high resolution mass spectrometer. Another unique feature of the department is the herd of bleeder swine maintained for blood coagulation research.

Graduate students may receive financial support by assisting in grant-supported research, Experiment Station research and as teaching assistants. The Experiment Station Chemical Laboratories offer an additional opportunity for financial support and practical experience.

M.S. DEGREE REQUIREMENTS

For admission to candidacy, the student should have completed: general chemistry (10 hours), quantitative analysis (4 hours), organic chemistry (8 hours), physics (8 hours), physical chemistry (3 hours), and a

biological science (5 hours). Students with deficits will be allowed to make them up without credit. An applicant must perform at a satisfactory level on the GRE and including the section in Chemistry or Biology. Besides the general Graduate School requirements—30 hours of credit, with no more than 12 hours of research credit, and including 15 hours of 400-level courses—a candidate must complete 6 hours of general biochemistry and a thesis based on original research. An oral examination in defense of the thesis and over pertinent course work must be passed to complete requirements.

Ph.D. DEGREE REQUIREMENTS

To become a candidate for the Ph.D. degree, a student must pass a qualifying examination consisting of standardized ACS examinations in organic, analytical, and either biochemistry or physical chemistry. For entrance into the Ph.D. program a student must have completed one year of physical chemistry based on differential and integral calculus.

Students who make an outstanding score on the qualifying examination and who achieve scholastic excellence during the first year in residence may bypass the Master's degree and become a Ph.D. candidate directly. Advancement to candidacy without the Master's degree requires departmental staff approval.

Whereas the Ph.D. is primarily a research degree and the candidate is judged by his ability to conduct independent and original research, certain formal courses are required. The minimal requirements are 6 hours of general biochemistry (physical chemistry prerequisite), 3 hours of intermediate organic chemistry, 2 hours of seminar and 9 hours in an area of concentration outside of the departments of Agricultural Chemistry and Biochemistry. A reading knowledge of one language is required. Satisfactory performance on the comprehensive examination, part of which is administered by a departmental committee; submission of an acceptable dissertation; and satisfactory defense of the thesis during the final oral examination complete the requirements.

AGRICULTURAL ECONOMICS

CHARLES L. CRAMER, Ph.D., University of Missouri-Columbia. Chairman; Director of Graduate Studies; Prof.

GORDON BIVENS, Ph.D., Iowa State University. Prof.

KENNETH B. BOGGS, Ph.D., University of Wisconsin. Prof.

HAROLD F. BREIMYER, Ph.D., American University. Prof.

ROBERT M. FINLEY, Ph.D., University of Illinois. Prof.

KENNETH U. FLOOD, D.B.A., Harvard University. Prof.

ALBERT R. HAGAN, Ph.D., Michigan State University. Prof.

STANLEY JOHNSON, Ph.D., Texas A&M. Prof.

J. WENDELL MCKINSEY, A.M., University of Missouri-Columbia. Prof.

EDWARD METZEN, Ed.D., University of Missouri-Columbia. Prof.

V. JAMES RHODES, Ph.D., Harvard University. Prof.

JERRY G. WEST, Ph.D., Michigan State University. Prof.

STEPHEN F. WHITTED, Ph.D., University of Missouri-Columbia. Prof.

LLOYD BENDER, Ph.D., University of Missouri-Columbia. Assoc. Prof.

ROBERT BEVINS, Ph.D., Michigan State University. Assoc. Prof.

MELVIN G. BLASE, Ph.D., Iowa State University. Assoc. Prof.

CURTIS H. BRASCHLER, Ph.D., Purdue University. Assoc. Prof.

DURWARD BREWER, Ph.D., University of Missouri-Columbia. Assoc. Prof.

GARY DEVINO, Ph.D., Pennsylvania State University. Assoc. Prof.

JOSEPH C. HEADLEY, Ph.D., Purdue University. Assoc. Prof.

VICTOR E. JACOBS, Ph.D., Kansas State University. Assoc. Prof.

DONALD D. OSBURN, Ph.D., North Carolina State University. Assoc. Prof.

LEONARD A. VOSS, Ph.D., University of Missouri-Columbia. Assoc. Prof.

PHILIP F. WARREN, Ph.D., Michigan State University. Assoc. Prof.

CARROL KIRTLEY, Ph.D., University of Missouri-Columbia. Asst. Prof.

DONALD LEVI, J.D., University of Missouri-Columbia. Asst. Prof.

FRANCIS P. MCCAMLEY, Ph.D., Iowa State University. Asst. Prof.

KENNETH SCHNEEBERGER, Ph.D., Oklahoma State University. Asst. Prof.

RANDALL TORGERSO, Ph.D., University of Wisconsin. Asst. Prof.

The Department of Agricultural Economics offers graduate work leading to the Master of Science and Doctor of Philosophy degrees. The Ph.D. program emphasizes preparation for research, teaching, and extension. The M.S. program may be a step toward the Ph.D., but is frequently used as a terminal program for those interested in agribusiness, extension, or government. Graduate students may emphasize such specialty areas as farm management, and production economics, marketing, economic development, agribusiness and logistics, and resource economics. Programs are flexible—while all Ph.D. and most M.S. students become involved in the department's research program, those whose career interests lie in other directions will find the department willing to accommodate them.

The department has a young but experienced faculty, several of whom have received national recognition in the field. It maintains a computer programming staff; has available a statistical pool for projects not involving the computer; employs research technicians; and provides a reference room where journal series, statistical publications, and other recent publications are readily available.

Financial assistance in the form of fellowships and assistantships for research and teaching are available. A 3.00 G.P.A. ($A=4.0$) is generally a minimum requirement. Support for research is also available from the Agricultural Experiment Station and other granting agencies. Further, after one semester, the records of graduate students without assistantships are evaluated and financial assistance is offered to those students who show superior performance and promise. Write the Department Chairman.

THE M.S. DEGREE

Students should refer to the general requirements for admission and continuation given in this bulletin. Students with grade averages much below 2.75 are discouraged from applying. Before admission to the M.S. program, a student should have completed 16 hours of agricultural economics and/or economics.

To qualify for the M.S. degree, a minimum of 30 hours selected from courses

receiving graduate credit must be completed. The program must include at least one graduate-level course in micro and macro economic theory and one graduate-level course in statistics. Credit for research (usually 6 to 8 hours) is included in the minimum of 30 hours required for the degree.

There is no language requirement for the M.S., and a thesis is optional. A technical paper or additional courses may be substituted with the permission of the Department.

Each candidate for the M.S. degree is required to take a final oral examination upon completion of other requirements.

THE Ph.D. DEGREE

Departmental acceptance of the student as a Ph.D. candidate is based upon his satisfactory performance on a Master's examination or Ph.D. qualifying examination, written and/or oral.

The size, quality, and diversity of the faculty permits a broad choice of advisers and research topics. In addition to the usual areas of farm management-production economics, marketing, and resource-economics, there are opportunities for specializing in marketing policy, quantitative methods, business logistics, and domestic and international economic development.

The student and his advisory committee have considerable latitude in planning his program of study. There is no language requirement. There is no requirement as to total hours, although the program usually includes about 15-18 courses (excluding research) beyond the Bachelor's degree. The courses should prepare the student to pass the departmental and comprehensive examinations as well as to emphasize any area of his particular interest.

The department has these general course requirements: agricultural economics—a well balanced selection of courses including at least four courses at the 400-level; economic theory—courses in micro and macro theory at the intermediate and advanced level; quantitative methods—at least one course in calculus and courses in introductory mathematical economics and econometrics; outside field—a minimum of 9 hours graduate-level coursework

in some department other than economics and agricultural economics.

At sometime during his graduate work each student must pass standardized departmental examinations in agricultural economics, economic theory, and a specialty area such as econometrics; farm management and production economics; marketing; economic development; agribusiness and logistics; or resource economics.

A dissertation embodying the results of original research must be written on a subject approved by the candidate's advisory committee. A final oral examination over the dissertation completes the degree requirements.

AGRICULTURAL ENGINEERING

C. LEROY DAY, Ph.D., P.E., Iowa State University. Chairman; Director of Graduate Studies; Prof.

ROBERT P. BEASLEY, A.M., P.E., University of Missouri-Columbia. Prof.

DONALD B. BROOKER, M.S., P.E., University of Missouri-Columbia. Prof.

MILTON D. SHANKLIN, Ph.D., P.E., University of Missouri-Columbia. Prof.

HAROLD V. WALTON, Ph.D., P.E., Purdue University. Prof.

JAMES C. FRISBY, Ph.D., P.E., Iowa State University. Assoc. Prof.

CARROLL E. GOERING, Ph.D., P.E., Iowa State University. Assoc. Prof.

KENNETH L. MCFATE, M.S., P.E., University of Missouri-Columbia. Assoc. Prof.

JAMES S. MCKIBBEN, M.S., University of Missouri-Columbia. Assoc. Prof.

JACKIE W. D. ROBBINS, Ph.D., P.E., North Carolina State University. Assoc. Prof.

CHARLES F. CROMWELL, M.S., P.E., University of Missouri-Columbia. Asst. Prof.

H. DAVID CURRENCE, Ph.D., Iowa State University. Asst. Prof.

NEIL F. MEADOR, Ph.D., P.E., Michigan State University. Asst. Prof.

LOREN E. BODE, M.S., P.E., University of Missouri-Columbia. Research Assoc.

MAURICE R. GEBHARDT, M.S., P.E., University of Missouri-Columbia. Research Assoc.

G. LEROY HAHN, Ph.D., P.E., University of California. Research Assoc.

KEITH E. SAXTON, M.S., P.E., University of Wisconsin. Research Assoc.

The Department of Agricultural Engineering offers graduate study leading to

the degrees of Master of Science and Doctor of Philosophy in Agricultural Engineering.

Graduate programs in Agricultural Engineering are designed to prepare students for advanced professional careers in these fields. The Master's degree, when it is the terminal degree, generally prepares the student for a position in industry or government, while the Ph.D. degree prepares the student for a research position in industry, government, or college research and teaching.

Active research programs in the Department of Agricultural Engineering include the following areas: bio-engineering, crop processing, environment control, food engineering, irrigation and drainage, materials handling, power and machinery, soil and water control, structures and environment, tillage, waste disposal, and weed control.

Special facilities for research include: (1) the Missouri Climatic Laboratory, which provides facilities for the study of animal-environment interactions; (2) the Missouri partitioned calorimeter, which permits precise measurement and partition of heat generated by animals under a wide environmental range; (3) an agricultural pollution and water quality research laboratory; and (4) an electronics laboratory equipped with a stroboscope, analog computer, x-y plotter and strip chart recorders. Informational resources include: (1) a departmental library; (2) the University of Missouri-Columbia Library, which subscribes to all pertinent technical journals, domestic and foreign, in the field of Agricultural Engineering; (3) a microfiche collection of papers presented at major technical society meetings during recent years; and (4) the Computational Services Center, which includes an extensive library of taped programs applicable to the various fields of Agricultural Engineering research.

Fellowships, scholarships and research assistantships are available to qualified graduate students. Write the department chairman for specific information.

THE M.S. DEGREE

The Master of Science degree in Agricultural Engineering is designed for students who have an undergraduate degree in Agricultural Engineering or essentially

its equivalent. The student's GPA will be considered in competition with other applicants at the same time, with consideration given to grade trends, class rank, and recommendations of his undergraduate faculty. All students are expected to take the GRE.

The degree requirements are those of the Graduate School. A student should complete a minimum of 30 hours of graduate work, with at least 15 in 400-level courses. Twelve hours may be in research or special problems. A thesis is required of students supported on research assistantships and is optional for others. Additional regulations governing the Master's Degree are given elsewhere in this bulletin.

THE Ph.D. DEGREE

The program for the degree of Doctor of Philosophy in Agricultural Engineering is designed to prepare students for research and for college teaching in Agricultural Engineering. This program normally requires three years beyond the Bachelor's degree and the student must demonstrate his ability to carry on independent research by presenting a dissertation embodying the results of original investigation.

The departmental acceptance of the candidate is based upon his satisfactory performance on a Master's examination or Ph.D. qualifying examination, written and/or oral. Candidacy of a student who has earned a Master's degree elsewhere shall be determined by an examination administered by the Department. The other requirements for admission and continuation are basically the same as those given above for the M.S. in Agricultural Engineering.



The Department of Agricultural Engineering imposes no requirements for the Ph.D. degree except those required by the Graduate School, as specified elsewhere in this bulletin.

AGRONOMY

The Department of Agronomy has two sections, each of which offers the degrees of Master of Science and Doctor of Philosophy. The two sections, Crop Science and Soil Science, are described below.

CROP SCIENCE

ROGER L. MITCHELL, Ph.D., Iowa State University. Chairman; Director of Graduate Studies; Prof.

LAUREL E. ANDERSON, Ph.D., University of Minnesota. Prof.

JOE D. BALDRIDGE, Ph.D., University of Missouri-Columbia. Prof.

O. HALE FLETCHALL, Ph.D., University of Missouri-Columbia. Prof.

NORMAN E. JUSTUS, Ph.D., Oklahoma State University. Prof.

GARY F. KRAUSE, Ph.D., Virginia Polytechnic Institute. Prof.

KENNETH L. LARSON, Ph.D., University of Wisconsin. Prof.

ARTHUR G. MATCHES, Ph.D., Purdue University. Prof.

JOHN M. POEHLMAN, Ph.D., University of Missouri-Columbia. Prof.

GYORGY P. REDEI, Ph.D., University of Budapest. Prof.

WILLIAM P. SAPPENFIELD, Ph.D., University of Missouri-Columbia. Prof.

ERNEST R. SEARS, Ph.D., Harvard University. Prof.

MARCUS S. ZUBER, Ph.D., Iowa State University. Prof.

KAY H. ASAY, Ph.D., Iowa State University. Assoc. Prof.

LOYD E. CAVANAH, M.S., University of Missouri-Columbia. Assoc. Prof.

GREGORY G. DOYLE, Ph.D., University of Illinois. Assoc. Prof.

LEO A. DUCLOS, Ph.D., Purdue University. Assoc. Prof.

R. DWAIN HORROCKS, Ph.D., Pennsylvania State University. Assoc. Prof.

HAROLD KERR, Ph.D., Washington State University. Assoc. Prof.

GORDON KIMBER, Ph.D., University of Manchester. Assoc. Prof.

RUSSELL L. LARSON, Ph.D., University of Illinois. Assoc. Prof.

CURTIS J. NELSON, Ph.D., University of Wisconsin. Assoc. Prof.

ELROY J. PETERS, Ph.D., University of Wisconsin. Assoc. Prof.

DALE T. SECHLER, Ph.D., University of Missouri-Columbia. Assoc. Prof.

HOWELL N. WHEATON, Ph.D., University of Kentucky. Assoc. Prof.

JACK B. BECKETT, Ph.D., University of Wisconsin. Asst. Prof.

DAVID R. JOHNSON, Ph.D., University of Guelph. Asst. Prof.

LOTTIE M. SEARS, Ph.D., University of California. Asst. Prof.

VIOLA MAY STANWAY, M.A., University of Missouri-Columbia. Asst. Prof.

VIRGIL D. LUEDDERS, Ph.D., Michigan State University. Research Assoc.

The requirements for the Master of Science degree in Crop Science may be fulfilled through either of two options: with thesis or without thesis.

Areas of concentration which a student may pursue in Crop Science include: plant breeding, crop production, crop physiology, pasture management, weed science, and seed technology.

The Department has excellent field and greenhouse facilities and several controlled-environment growth chambers and rooms.

Master's fellowships, scholarships, traineeships, and teaching and research assistantships are available to those who have high qualifications. On the doctoral level, the Department participates through the Graduate School in offering NDEA Title IV Fellowships and NSF traineeships. Teaching and research assistantships are available in the Department, as are paid positions on research projects. For details apply to the Director of Graduate Studies, Department of Agronomy.

MASTER OF SCIENCE WITH THESIS

This program is sufficiently flexible to include those with undergraduate majors in biological or physical sciences, as well as those with majors in Agronomy or various other agricultural specialties. Applicants should have demonstrated their ability to perform graduate level work; a GPA of at least 3.0 ($A=4.0$) in the last two years of undergraduate study is desirable. Ideally, the applicant's academic background

should include at least one course in each of the following: calculus; physics; inorganic, analytical, and organic chemistry; botany; genetics. Inadequacies can be remedied through additional course work. GRE results are required.

The course of study follows Graduate School regulations: 30 credit hours with 15 of these in 400-level courses and not more than 12 in research, problems, special investigations, and special readings. One or two credit hours in Graduate Seminar are required. At least 9 credits of Crop Science in the 300 or 400 series or equivalent and 3 credits of Soil Science in the 300 or 400 series or equivalent are to be included on the student's graduate and/or undergraduate program.

The required thesis and examinations, in accordance with Graduate School regulations, complete the requirements. Other regulations regarding such matters as residence are covered elsewhere in this bulletin.

MASTER OF SCIENCE WITHOUT THESIS

This program is designed for those who desire a broad scope of agronomic knowledge. As a non-thesis option, it will not serve in lieu of a Ph.D. qualifying examination.

It is expected that most students entering this program will have undergraduate majors in Agronomy or in other agricultural specialties. The student's background should be such that he is prepared for a quantitative approach to agronomic problems. A GPA of at least 3.0 in the last two years of undergraduate study is desirable.

A minimum of 30 credit hours selected from courses receiving graduate credit must be completed. In many instances, additional hours are required. Fifteen or more hours must be taken in courses numbered 400 or above. At least 12 credit hours must be devoted to subject matter courses in the 300 and 400 series listed by the Department of Agronomy. This, together with the candidate's previous work, must constitute a broad and soundly based program in Agronomy.

One or two credits in Graduate Seminar are required. The candidate must present a three- or four-hour special problem accompanied by a well-written report. This project is graded jointly by the student's adviser and one faculty member from the Department of Agronomy.

The Department of Agronomy will arrange for a written examination designed to permit the candidate to demonstrate adequate knowledge.

Ph.D. DEGREE REQUIREMENTS

The Ph.D. program is based on completion of a Master's degree program (or its equivalent) of such quality that the candidate shows definite promise of becoming a capable investigator in his chosen field. Non-thesis Master's candidates and applicants who have not taken the final examination for the M.S. in Crop Science at the University of Missouri-Columbia must take a qualifying examination equivalent to the M.S. final examination during their first semester of study.

Degree requirements are substantially those of the Graduate School. The course of study should include three hours of Graduate Seminar.

Other regulations governing the degree of Doctor of Philosophy are given elsewhere in this bulletin.

SOIL SCIENCE

ROGER L. MITCHELL, Ph.D., Iowa State University. Chairman; Director of Graduate Studies; Prof.

ELLIS R. GRAHAM, Ph.D., University of Missouri-Columbia. Prof.

C. EDMUND MARSHALL, Ph.D., University of London. Prof.

CLARENCE L. SCRIVNER, Ph.D., University of Missouri-Columbia. Prof.

GEORGE E. SMITH, Ph.D., University of Missouri-Columbia. Director of Water Resources Center; Prof.

GEORGE H. WAGNER, Ph.D., University of Missouri-Columbia. Prof.

C. M. WOODRUFF, Ph.D., University of Missouri-Columbia. Prof.

ROBERT W. BLANCHAR, Ph.D., University of Minnesota. Assoc. Prof.

JAMES R. BROWN, Ph.D., Iowa State University. Assoc. Prof.

TED R. FISHER, Ph.D., University of Missouri-Columbia. Assoc. Prof.

EARL M. KROTH, Ph.D., Ohio State University.
Assoc. Prof.

WILLIAM J. UPCHURCH, Ph.D., University of
Missouri-Columbia. Assoc. Prof.

JOE M. BRADFORD, Ph.D., Iowa State University.
Research Assoc.

The requirements for the Master of Science degree in Soil Science may be fulfilled through either of two options: with thesis or without thesis.

Areas of concentration which a student may pursue in Soil Science are: soil fertility and plant nutrition, soil physics, soil chemistry and mineralogy, soil genesis and classification, soil microbiology and biochemistry, soil conservation and management.

The department has excellent field and greenhouse facilities and several well-equipped laboratories for radioactive tracer analysis, mineralogical and electrochemical methods, studies of soil genesis, and for microbiological, general, and physical investigations on soils.

Master's fellowships, scholarships, traineeships, and teaching and research assistantships are available for those students with high qualifications. On the doctoral level, the department participates through the Graduate School in offering NDEA Title IV Fellowships and NSF traineeships. Teaching and research assistantships are available in the department, as are paid positions on research projects. For details, apply to the Chairman of Graduate Studies, Department of Agronomy.

MASTER OF SCIENCE WITH THESIS

This program is sufficiently flexible that those with undergraduate majors in biological or physical sciences, as well as those with majors in Agronomy or various other agricultural specialties, may find a place. Applicants should have demonstrated their ability to do graduate level work; a GPA of at least 3.0 ($A=4.0$) in the last two years of undergraduate study is desirable. Ideally, the undergraduate background should include at least one course in each of the following: calculus; physics; inorganic, analytical and organic chemistry; botany; geology; atmospheric science. Inadequacies may be remedied by additional course work. GRE scores are required.

The course of study follows Graduate School regulations: 30 credit hours with 15 in 400-level courses and not more than 12 in research, problems, special investigations, and special readings. One or two credits in Graduate Seminar are required. At least 9 credits of Soil Science in the 300 or 400 series or equivalent and 3 credits of Crop Science in the 300 or 400 series or equivalent are to be included on the student's graduate and/or undergraduate program.

The required thesis and examinations, in accordance with Graduate School regulations, complete the requirements. Other regulations regarding residence and such matters are covered elsewhere in this bulletin.

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MASTER OF SCIENCE WITHOUT THESIS

This program is designed for those who have need of a broad range of agronomic knowledge. As a non-thesis option, it will not serve in lieu of the Ph.D. qualifying examination.

It is expected that most students entering this program will have undergraduate majors in Agronomy or other agricultural specialties. The student's academic background should be such that he is prepared for a quantitative approach to agronomic problems. A GPA of at least 3.0 in the last two years of undergraduate study is desirable.

A minimum of thirty hours selected from courses receiving graduate credits must be completed; in some instances, additional hours may be required. Fifteen or more credit hours must be in courses numbered 400 or above.

At least 12 hours of credit must be taken from subject matter courses in the 300 and 400 series listed by the Department of Agronomy. This, together with the candidate's previous work, must continue a broad and soundly based program in Agronomy.

One or two credit hours in Graduate Seminar are required. The candidate must present a 3- or 4-hour special problem investigation, accompanied by a well-written report. This project is graded jointly by the student's adviser and one faculty member from the Department of Agronomy.

The Department of Agronomy will arrange for a written examination, designed for demonstration of the candidate's knowledge.

Ph.D. PROGRAM

Entrance to the Ph.D. program is based on completion of a Master's degree program (or its equivalent) of such quality that the candidate shows definite promise of becoming a capable investigator in his chosen field. Non-thesis applicants who have not taken the final examination for the M.S. in Soil Science at UMC must take a qualifying examination equivalent to the M.S. final examination during the first semester of study.

Degree requirements are substantially those of the Graduate School. The course of study should include three hours of Graduate Seminar.

The regulations governing the degree of Doctor of Philosophy are given elsewhere in this bulletin.

ANATOMY

C. ROLAND LEESON, M.A., M.D., Cambridge University. Chairman; Prof.

JAMES A. GREEN, Ph.D., University of Illinois. Director of Graduate Studies; Prof.

EDWARD W. LOWRANCE, Ph.D., Stanford University. Prof.

HERBERT E. BROWN, Ph.D., Utah University. Assoc. Prof.

J. HARRY CUTTS, Ph.D., University of Western Ontario. Assoc. Prof.

JOHN D. DECKER, Ph.D., Syracuse University. Assoc. Prof.

BARRIE D. SMITH, Ph.D., Iowa State University. Assoc. Prof.

WILLIAM R. GOODGE, Ph.D., Washington University. Asst. Prof.

DANIEL E. OVERACK, Ph.D., Indiana University. Asst. Prof.

GARY DUNKERLEY, Ph.D., University of Texas, Galveston. Asst. Prof.

WILLIAM KRAUSE, Ph.D., University of Missouri-Columbia. Asst. Prof.

The Department of Anatomy offers courses of study at the graduate level leading to the degrees of Master of Arts and Doctor of Philosophy. These programs are designed to prepare students for teaching Anatomy and to carry on research in Morphology. The department also cooperates with the Department of Veterinary

Anatomy in presenting a course of study for the Ph.D. with emphasis in veterinary anatomy. These programs are individually arranged.

Currently anatomists are concerned with structures ranging from the macromolecule through those visible to the naked eye. It is necessary that present programs train students thoroughly in morphology and in biology and biochemistry as well.

Specific areas of concentration are histology, embryology, hematology, endocrinology, reproductive biology.

The Department of Anatomy has an Electron Microscope Laboratory in addition to other facilities of the Medical Sciences Building and of the University of Missouri-Columbia Hospital.

Queries concerning financial aids and/or pertaining to the program should be addressed to the department chairman.

MASTER'S PROGRAM

The Master's program is primarily designed to lead to the Doctoral program of study. However, selected professional students seeking to expand their knowledge of morphology and gain research training will be accepted into the program. This program is aimed at providing the candidate with training in the fundamentals of Anatomy, and in addition will contain an introduction to function and research.

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. However, in addition, candidates are expected to have an overall undergraduate GPA of 2.75 ($A=4$) to be accepted for advisement in the Anatomy Graduate Program. The candidate should have at least 24 semester hours of course work in biological science, including comparative anatomy. Outside the biological sciences the candidate is expected to have taken courses in chemistry including inorganic, analytical and organic, and further to have credits in college physics and mathematics (college algebra and trigonometry). All candidates must have taken the Graduate Record Examination and show evidence of rank above the fiftieth percentile.

Applicants for admission to candidacy should address their applications to the

Director of Admissions, 130 Jesse Hall. These applications should contain a complete transcript of college credits and a copy of the GRE score. In addition the applicant should arrange for two professors who have taught courses to the applicant to transmit letters of recommendation for the applicant to the departmental Chairman. Upon receipt of this material it will be evaluated by the Department and the applicant will immediately be notified as to his acceptance or otherwise.

Course of study: If the incoming candidate has not decided upon an adviser by the beginning of his initial semester, the Departmental Director of Graduate Studies will serve as an interim adviser. The candidate should select a faculty adviser no later than by the end of the second semester's study.

During the first academic year of the program the candidate will complete the departmental courses in Gross Anatomy, Microscopic Anatomy, Developmental Anatomy, and Neuroanatomy. In addition to these the candidate will complete a course in biochemistry and at least one other scientific course during this initial year.

The second year of the program will be designed by the candidate's adviser with the help of the advisory committee. This advisory committee will be composed of the adviser and two other members, one of whom must be from a Department other than the Anatomy Department. This year will be devoted to continued course work and preparation of a thesis. During this year the candidate must take at least 9 hours of course work at the 300 level or above (this does not include thesis or problem courses). During the Master's program each candidate must have 15 hours or more in 400-level courses; no more than 12 of these hours in research, problems, special investigations and special readings may be counted in fulfilling this requirement.

DOCTORAL PROGRAM

Admission: Candidates seeking acceptance to this program should submit transcripts of graduate and undergraduate credits, a copy of their GRE, and a copy of their Master's Theses (if applicable) to the Departmental Chairman. Also arrangements

should be made for their Master's advisers (if applicable) and one other professor to transmit letters of recommendation supporting candidacy to the Department. After evaluation of this material the Department will determine the acceptability of the candidate.

Course of study: Prior to or immediately upon entering the program the candidate must select a faculty adviser.

The adviser, with the consent of the Graduate School Dean, will arrange for an advisory committee to be chaired by the adviser and composed of at least four other members. This committee must be chosen from the Graduate Faculty, at least two members must be from the Department of Anatomy, and at least one must be from a department other than Anatomy.

The committee, with the help of the adviser, will study the candidate's past performance and his objectives. They will then construct a study program for the candidate using guidelines set forth in the rest of this section. This program should be drawn up and submitted to the Graduate School through the Director of Graduate Studies by the end of the candidate's first semester of study.

The following subjects are basic to the program and are required of all students: Gross Anatomy, Microscopic Anatomy, Developmental Anatomy, and Neuroanatomy. Some students will have completed these courses during their earlier program and therefore will have fulfilled these requirements before entering the Doctorate program.

In addition, the candidate must pursue formal course work in the following subjects: Cell Biology (this is to include cellular physiology and cytology); General Biochemistry and one biochemical course at the graduate level beyond biochemistry; Mammalian Physiology and one physiological course at the graduate level beyond Mammalian Physiology; Genetics; and Seminar. Earlier course work completed in these subjects may be applied to these requirements.

Lastly, there is a language or language and collateral field requirement that must be fulfilled. At the student's option he may fulfill this by either of the following two methods.

Languages: The candidate must successfully pass an examination in each of two foreign languages. These examinations will be administered by the Testing and Counseling Service of UMC, 306 Parker Hall. These tests are given and graded on a national basis.

Language and collateral field: The candidate must successfully complete an examination in a foreign language. This examination will be administered by the Testing and Counseling Service of UMC. The candidate must complete 9 hours of graduate-level course work in a collateral field or a research technique. This course work must be approved by the Advisory Committee and the Department; it will not count toward residency.

The candidate is required to maintain at least *B* work during his studies and is permitted only one *C* grade. However, if his option includes the collateral field, *C* grades are acceptable in those courses taken in the collateral field.

Examinations: After completion of most of the course work, two years of residence, and the completion of the language requirement or language and collateral field requirement, a comprehensive examination will be given. This examination will be conducted by the candidate's advisory committee and will contain both a written and an oral portion. A candidate will be considered to have passed the examination if all or all but one of the advisory committee vote that he pass. In the event of failure, at least 12 weeks must elapse before a re-examination may be held. Failure to pass two comprehensive examinations automatically terminates candidacy.

Dissertation: Each candidate will initiate and complete an independent and original research project that is worthy of publication. The results of this research will be embodied in the Doctoral dissertation. When the dissertation has been approved by the candidate's adviser and one other member of the committee serving as second reader (this second reader must be a member of the Department of Anatomy), a third reader from outside the Department of Anatomy will be appointed by the Graduate School Dean to read the dissertation. In addition to the three read-

ers required by the Graduate School, the Anatomy Department requires a fourth reader. This person is recommended by the candidate's adviser. He must be a recognized authority in the field of research of the thesis and must not be a member of the faculty of UMC. After the four readers have approved the dissertation, the advisory committee will be convened to conduct a final oral examination of the dissertation. Successful defense of the dissertation will be determined by vote of the committee, and if all members of the committee or all but one vote in favor of the defense the Graduate Dean will be notified that the candidate has fulfilled all of the requirements for the degree.

ANIMAL HUSBANDRY

ALBERT J. DYER, Ph.D., University of Missouri-Columbia. Chairman; Director of Graduate Studies; Prof.

J. MALCOLM ASPLUND, Ph.D., University of Wisconsin. Assoc. Prof.

BILLY N. DAY, Ph.D., Iowa State University. Prof.

JOHN F. LASLEY, Ph.D., University of Missouri-Columbia. Prof.

WILLIAM H. PFANDER, Ph.D., University of Illinois. Prof.

CLARENCE V. ROSS, Ph.D., University of Illinois. Prof.

GRANVILLE B. THOMPSON, Ph.D., University of Missouri-Columbia. Assoc. Prof.

JACK L. CLARK, Ph.D., University of Missouri-Columbia. Asst. Prof.

GLENN RICHARDSON, Ph.D., Colorado State University. Asst. Prof.

TRYGVE L. VEUM, Ph.D., Cornell University. Asst. Prof.

The Department of Animal Husbandry provides graduate study leading to the degrees of Master of Science and Doctor of Philosophy. Areas of concentration which a student may pursue are animal breeding, animal nutrition, livestock production and management, and reproductive physiology.

Graduate programs in Animal Husbandry are designed to prepare students for research or advanced professional scientific careers in Nutrition, Reproduction Physiology and other fields in the biological sciences or in advanced systems in production and management of beef, sheep, or swine. The M.S. degree will prepare a student for

a position in industry, teaching, or agriculture extension and will also provide training toward the Ph.D. degree. The Ph.D. program is designed to prepare students for research in various fields and for college and university teaching.

The Agriculture Experiment Station laboratory is very helpful to all the researchers whose work involves chemical analysis. The Agriculture Experiment Station statistician provides excellent counsel in planning and interpretation. Facilities and land for red-meat animal research are available and used. The Animal Science Research Center was completed in 1970; basic research in nutrition and physiology will be conducted there.

There are thirty graduate assistantships within the department. Some students qualify for NDEA support and others for grants established by animal science related industries. Write the department chairman for information and application forms.

DEGREE REQUIREMENTS

To be accepted as a candidate for advanced degrees in Animal Husbandry, a student must meet the requirements for admission to Graduate School and preferably have a B.S. in Agriculture. To do graduate work in each area of concentration mentioned previously, a student must complete the principal courses required of the UMC undergraduates majoring in that area. Students enrolling at UMC for graduate study may, when necessary, enroll in the necessary undergraduate courses and at the same time in graduate courses.

There is no language requirement for the M.S. Course requirements include 32 credit hours of which 8 in research are usually required. A thesis is required in nearly all cases. See also the regulations governing the Master's degree as given elsewhere in this bulletin.

For the Ph.D. degree, admission requirements are those of the Graduate School. The nature of the qualifying examination is determined by the graduate student's advisory committee.

The number of credit hours in formal course work and in research varies with the student's background, training, his interests, and the nature of the research.

The language requirement for the Ph.D. degree may be fulfilled by showing proficiency in two foreign languages or in one foreign language and one collateral field, or in two collateral fields. A research technique may substitute for a collateral field.

A dissertation or a paper suitable for publication in a scientific journal or as an Experiment Station bulletin is required of all candidates for advanced degrees.

Refer also to the regulations governing doctoral degrees as given elsewhere in this bulletin.

ANTHROPOLOGY

ROBERT A. BENFER, Ph.D., University of Texas.
Chairman; Assoc. Prof.

PETER M. GARDNER, Ph.D., University of Pennsylvania. Director of Graduate Studies; Assoc. Prof.

CARL H. CHAPMAN, Ph.D., University of Michigan. Prof.

JAMES A. GAVAN, Ph.D., University of Chicago. Prof.

ROBERT F. G. SPIER, Ph.D., Harvard University. Prof.

H. CLYDE WILSON, Ph.D., University of California. Prof.

W. RAYMOND WOOD, Ph.D., University of Oregon. Prof.

JAMES W. HAMILTON, Ph.D., University of Michigan. Assoc. Prof.

RICHARD A. KRAUSE, Ph.D., Yale University. Assoc. Prof.

MICHAEL C. ROBBINS, Ph.D., University of Minnesota. Assoc. Prof.

RALPH M. ROWLETT, Ph.D., Harvard University. Assoc. Prof.

ROBERT T. BRAY, M.A., University of Missouri-Columbia. Asst. Prof.

RICHARD A. DIEHL, Ph.D., Pennsylvania State University. Asst. Prof.

ALDEN REDFIELD, M.A., Harvard University. Director of Museum; Instructor

MARGOT LIBERTY, M.A., University of Minnesota. Instructor

The Department of Anthropology offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy. The program of study for the Master's degree is designed to provide a broad training in anthropology. Once this body of knowledge has been mastered, the student is prepared to proceed to specialized study at the doctoral level.

Anthropology is a synthesizing science built around concepts concerning man,

culture, and biological variability—all conceived in time and space. It covers a broad spectrum of particular interests and maintains relations, correspondingly, with a wide range of other disciplines.

The four recognized sub-fields of anthropology provide the areas of study for the graduate student. The doctoral candidate will normally specialize in one of these or, in consultation with his advisory committee, choose an area of specialization that cross-cuts some of the four recognized divisions or that includes some area outside traditional anthropology. These areas are (1) cultural anthropology: ethnohistory, technology, social anthropology, theoretical anthropology; (2) physical anthropology: behavior, growth and morphology, primatology, osteology; (3) archaeology: socio-cultural interpretation, experimental archaeology, field techniques and research, museology; and (4) linguistic anthropology: socio-linguistics, ethno-linguistics, bio-linguistics, linguistic reconstruction. Training in the methods of inductive procedures is provided for all sub-fields.

The Department of Anthropology emphasizes training in research. The Department maintains the Museum of Anthropology, skeletal collections of human and non-human primates, a comparative faunal collection for ecological studies, and, in addition, data on *Macaca mulatta* accumulated over the last twelve years. Other research facilities are the Sinclair Research Farm, with breeding colonies of *Macaca mulatta*, *Saimiri sciureus*, *Galago crassicaudatus*; Lyman Archaeological Research Center; Hamilton Archaeological Field School; and the Center for Research in Social Behavior. Wider University facilities include the Museum of Art and Archaeology; the State Historical Archives; the nuclear reactor; the Computer Center with extensive taped programs, including the BIOMED programs of the University of California; the Statistics Center; and the South Asia Center.

Anthropological field research opportunities exist in East Africa, South and Southeast Asia, Europe, Meso-America and Peru, and in the Plains and Mississippi Valley Drainage.

NSF Traineeships, NDEA Fellowships, teaching, research, and student assistantships, fellowships, and scholarships are available to qualified graduate students of anthropology. Applications for financial assistance should accompany applications for admittance to the graduate program and should be submitted by March 1 each year. Write for forms and additional information to Chairman, Graduate Studies Committee, Department of Anthropology, 210 Switzler Hall.

THE MASTER OF ARTS AND PRE-Ph.D. GRADUATE PROGRAM

Admission to the graduate program is not limited to students with undergraduate degrees in Anthropology. However, an entering student should have had an introductory (general) course and first-level specialized courses in cultural anthropology, archaeology, (or prehistory), linguistics, and physical anthropology, plus two additional courses in anthropology. A student deficient in background may be admitted as a provisional candidate and must make up his deficiency without graduate credit during the first year of graduate study.

In addition, an applicant should have a good undergraduate record with 3.0 ($A=4.0$) in anthropology courses and should show an acceptable performance on the GRE and on an oral preliminary examination administered during the student's first semester in residence.

A program tailored to the educational objectives of each student is worked out by him and his Advisory Committee. He must also pass an oral or written comprehensive M.A. Final Exam, which also functions as the Ph.D. Qualifying Examination for those students continuing graduate work in Anthropology at the University of Missouri-Columbia.

A thesis or formal research project is required for the Master's degree, for which work a maximum of six hours credit may be granted. Students who intend to proceed directly into the Ph.D. program have the opportunity to elect not to receive the M.A. degree, but will still be required to have successfully completed the M.A. thesis or formal research project.

THE Ph.D. PROGRAM

To be admitted to the Doctoral program in Anthropology, a student must show superior performance on the Aptitude Test of the GRE, have a Master's degree or equivalent, and a 3.0 or higher ($A=4.0$) GPA in graduate work to that point. For their qualifying examination, graduates of the M.A. program at UMC will be considered to have passed if they show (1) Ph.D.-level performance on the M.A. Comprehensive Examination, (2) satisfactory completion of a research project, and (3) satisfactory completion of one language requirement. Applicants presenting their M.A. degrees from another department of UMC or from another university will be required to pass an oral qualifying examination of at least one hour to be administered by the Graduate Studies Committee of the Department. In addition, they must show satisfactory completion of one language requirement. The department has the option of additionally requiring the student to pass the equivalent of the M.A. final examination.

All Ph.D. candidates will be required to serve as teaching assistants for at least one semester or one summer session.

The Ph.D. degree is primarily oriented toward research competence. Therefore the student will be judged and passed or failed on his research promise and ability.

There is no fixed requirement of courses, but it is expected that most students will amass 48 to 60 hours of graduate study beyond the M.A. The objective is to produce an anthropologist with some competence in all fields, but with a special competence in his chosen field for purposes of teaching, research, and evaluation of the results of other researchers. This competence encompasses not only a grasp of his field but an awareness of its relation to other fields in anthropology and to other areas.

A doctoral candidate must demonstrate ability to read two foreign languages; demonstration of proficiency in an approved research technique or collateral field may be substituted for one of these.

The candidate must pass a three-part comprehensive examination, and present an acceptable dissertation and defend it in

final examination. Additional regulations are presented in this bulletin in the section on doctoral degrees.

ART

ROBERT BUSSABARGER, M.A., Michigan State University. Chairman; Prof.

LAWRENCE MCKININ, M.F.A., Cranbrook Academy of Art. Prof.

JOHN S. WELLER, M.F.A., University of Illinois. Director of Graduate Studies; Prof.

DONALD L. BARTLETT, M.F.A., Cranbrook Academy of Art. Assoc. Prof.

LAWRENCE RUGOLO, M.F.A., University of Iowa. Assoc. Prof.

JERRY D. BERNECHE, M.F.A., Ohio University. Asst. Prof.

BROOKE B. CAMERON, M.A., University of Ohio. Asst. Prof.

MERRILL CASON, M.F.A., University of Oklahoma. Asst. Prof.

JAMES J. FROESE, M.A., University of Wichita. Asst. Prof.

JEAN GARRETT, M.F.A., Chicago Art Institute. Asst. Prof.

ELIZABETH T. MONTMINY, B.A., Radcliffe, Studied Art Student's League. Asst. Prof.

FRANK H. STACK, M.A., University of Wyoming. Asst. Prof.

MARILYN J. ZURMUEHLEN, Ed.D., Pennsylvania State University. Asst. Prof.

The Department of Art offers course work in the creative arts which leads to the Master of Arts Degree. For the degree, a student will major in one of these areas: design-architecture, design-crafts, drawing-painting, drawing-graphics, sculpture-drawing, sculpture-crafts. The craft courses are from weaving, jewelry, and ceramics. A student may choose to take a Master of Arts in Education, with art as his teaching field.

The Department of Art offers studio facilities for students working in unscheduled problems courses and laboratory facilities in the areas of drawing, painting, design, printmaking, ceramics, sculpture, weaving, and jewelry. The Art Department gallery schedules regular monthly exhibitions which provide an opportunity for students to experience and relate to a variety of traditional and contemporary examples of art. The University of Missouri-Columbia Library has an adequate collection of books, periodicals and reference materials and a small museum. Art collec-

tions and exhibitions are maintained locally at Stephens College and Columbia College. Art collections of UMC are described in a separate section on resources and research.

Teaching assistantships are available as are jobs as lab assistants. Write the department for details concerning these positions.

A student who intends to become a candidate for a Master's degree in Art, in addition to being accepted by the Graduate School, must be so accepted as a candidate by the faculty of the Department of Art. Eligibility will be determined by an examination of the student's undergraduate performance and examples of his art work. A minimum of 40 hours of undergraduate art work is ordinarily required of the M.A. candidate. He must submit several examples of his work in a variety of areas, with emphasis on work in the area in which he intends to major. Examples of representational drawing (including figure drawing) must be included.

Upon acceptance, the student must report to the chairman of the Graduate Committee of the Art Department for assignment to an adviser to plan a program of study. This program must be filed within a month after admission or work done that semester will not be applied toward the degree. Students accepted by the Graduate School but not yet accepted by the department will be assigned advisers to plan a program which might lead to fulfillment of their candidacy requirements.

Of the 40 hours required for the M.A., 28 will be in studio arts, including a minimum of 15 hours in the major area, 6 hours in a minor field and an independent project (Problems, three hours) to be evaluated by the entire art faculty. The remaining 12 hours will be in academic subjects related to the major field. Of these 12 hours, as many as are needed will be in art history to complete a total of 15 taken in both undergraduate and graduate work. The remaining hours may be in 200-level or above courses related to a special interest of the art student. Usually these courses are in history, literature, anthropology, archaeology, and philosophy. Of the total course work, at least 15 hours will be in 400-level courses.

There is no language requirement. An exhibition will be presented in lieu of a

thesis. An oral examination follows completion of the above work.

ART HISTORY AND ARCHAEOLOGY

EDZARD BAUMANN, Ph.D., University of Vienna.
Chairman; Assoc. Prof.

OSMUND OVERBY, Ph.D., Yale University.
Director of Graduate Studies; Assoc. Prof.

MARIE FARNSWORTH, Ph.D., University of Chicago.
Visiting Prof.

PETER P. KAHANE, Ph.D., University of Basel.
Visiting Prof.

HELLMUT LEHMAN-HAUPT, Ph.D., University of Frankfurt. Prof.

HOMER L. THOMAS, Ph.D., University of Edinburgh. Prof.

SAUL S. WEINBERG, Ph.D., Johns Hopkins University. Prof.

LAURENCE SICKMAN, B.A., Harvard University.
Research Prof. at Kansas City.

RALPH T. COE, M.A., Yale University. Research
Assoc. at Kansas City

ROSS T. TAGGERT, M.A., Harvard University,
Research Assoc. at Kansas City

WILLIAM R. BIER, Ph.D., University of Pennsylvania. Asst. Prof.

ROBERT MUNMAN, Ph.D., Harvard University.
Asst. Prof.

VERA B. TOWNSEND, Ph.D., Emory University.
Asst. Prof.

The Department of Art History and Archaeology offers the M.A. and the Ph.D. degrees in Art History and in Archaeology, as well as an M.A. degree in either field in combination with the Museum Training Program, given in cooperation with the William Rockhill Nelson Gallery of Art in Kansas City, Missouri.

In the main library building is the library of Art and Archaeology, with over 60,000 volumes—one of the best in the country. The department's visual aids collection has over 65,000 photographs and 65,000 slides. Since 1957, the University Museum of Art and Archaeology has brought students in close contact with original works of art. Its archaeological collection has much material from University-sponsored excavations.

The Ford Foundation provides traineeships for doctoral candidates in archaeology to cover transportation and living expenses while training under faculty direction at excavation sites in Israel, Greece, and Italy. Traineeships are not restricted to

students at the University of Missouri-Columbia. Application deadline is January 1.

NDEA Fellowships are available for students admitted to the Ph.D. program in Art History or Archaeology. For students admitted to the Ph.D. program in Art History, the Kress Foundation Fellowships carry a stipend of \$2,000 and are renewable. One or more Travel Fellowships are also granted each summer. Other assistantships and fellowships are available to graduate students with stipends ranging from \$1,000 to \$2,500. These have application deadlines of February 20.

For a more detailed presentation of the fellowships and graduate programs available and the requirements for admission and for graduation, write: Director of Graduate Studies, Department of Art History and Archaeology, 329 Jesse Hall.

A limited number of persons will be admitted annually to the Graduate Programs. Preference will always be given to candidates for the Ph.D. degrees. Candidates are expected to hold a B.A. degree, or its equivalent, from an institution recognized by the University, in art history or art, in archaeology or classical languages, or in related fields of the humanities. All applications should be accompanied by GRE results and three recommendations.

THE M.A. DEGREE

The Department considers the M.A. a broad training program and stresses the diversification of courses. A person taking this degree will qualify for work in museums and for teaching positions in Junior Colleges. Requirements for the degree are a minimum of 30 credit hours of which 15 must be in the 400 level, and not more than 12 can be reading courses or special problems.

If students should have an insufficient background in related fields such as history, literature, philosophy, etc., they are expected to audit courses in the respective departments in or above the 200 level.

To be accepted for candidacy for the Master's degree, the student must be formally interviewed. He may apply for this Interview for Candidacy with the Department only after (1) having fulfilled the

language requirements, (2) having passed the Qualifying Examination, and (3) having decided on a specific field for his master's thesis with an adviser of his own choice. In this interview, the thesis will be discussed and the admission of the student to the candidacy for degree will be decided upon. Only after being admitted to candidacy may students take courses numbered 480 and 490. Students must demonstrate in written language examinations a proficiency in reading German, and French or Italian. At present, a passing score in the E.T.S. Foreign Language Examination is considered to fulfill this requirement. Students in classical archaeology are expected, in addition, to have a reading knowledge of both Greek and Latin. No student will be admitted to seminars (except 401 and 402), nor will he be granted an interview for candidacy, without meeting these requirements.

The qualifying examination will be given once each semester. Students must take this examination by their second semester of residence in which they are taking courses for graduate credit and are expected to have passed during their third semester in residence. Students in art history must show their familiarity with key monuments of the art of the Western world, from Egypt to the present. For students in Archaeology, a knowledge of key monuments of the ancient Near East—Egypt, Greece, Rome and of the Early Christian and Byzantine periods—is required.

A thesis is required. The student must submit a draft to the adviser at least two months before the final draft is due. The final oral examination includes the defense of the thesis and general questions in related fields.

The Department offers in cooperation with the William Rockhill Nelson Gallery of Art in Kansas City, Missouri an M.A. degree combining Art History and/or Archaeology with museum training. The program is scheduled for at least two years. All requirements for the M.A. degree except the thesis will have to be satisfied before the student can take up his internship at the Gallery. Simultaneously with this internship students will take reading courses with the Department (480) and write their M.A. thesis.

THE Ph.D. DEGREE

A Ph.D. is offered in Classical Archaeology or in Art History. For either degree an M.A. is a prerequisite. However, one may apply for the Ph.D. degree initially, in which case the Department reserves the right to require an M.A. thesis to be written. Without the M.A. degree, 72 hours are required; with the M.A., 48 hours are required.

The program of courses taken will be arranged by the student in close consultation with his major adviser and with the approval of his advisory committee.

The language requirement for the Ph.D. degree is the same as for the M.A. *plus* reading knowledge for preparation of the dissertation.

The qualifying examination is the same as for the M.A. Those with an M.A. from another institution must pass the examination in their first semester at UMC.

A formal interview is required for admission to Ph.D. candidacy and will be granted only on fulfillment of language and qualifying examination requirements and after a formal petition.

The comprehensive examination will consist of both oral and written examinations in the major and minor areas of Art History or Archaeology which have been decided upon in consultation with the advisory committee.

A dissertation is required and is expected to be an original contribution to scholarship in the field. The final examination will be in the form of an oral defense of the dissertation which will test the candidate's knowledge of his special field.

ATMOSPHERIC SCIENCE

WAYNE L. DECKER, Ph.D., Iowa State University. Chairman; Director of Graduate Studies; Prof.

GRANT L. DARKOW, Ph.D., University of Wisconsin. Prof.

ERNEST D. KUNG, Ph.D., University of Wisconsin. Prof.

JAMES B. HARRINGTON, Ph.D., University of Michigan. Assoc. Prof.

JAMES D. MCQUIGG, Ph.D., University of Missouri-Columbia. Assoc. Prof.

The Atmospheric Science Department offers graduate work leading to the degrees

of Master of Science and Doctor of Philosophy. Graduate programs in Atmospheric Science are designed to prepare students for professional careers in research and/or teaching in both the basic and applied aspects of the science. As an interdisciplinary field the program depends strongly on the course offerings of other departments, particularly those in the physical and mathematical sciences. Because of the broad scope of course offerings and research in atmospheric science, it is possible to design programs which build on the undergraduate training in a large number of fields such as physics, mathematics, engineering, statistics, and biology.

Research programs exist in the following areas: the energetics of the general circulation, the energy balance of the earth's surface and atmosphere with emphasis on crop production and water utilization, evaluation of weather modification programs, simulation of the social and economic effects of climate and climatic modification, climatological expectancies, the dynamics of cumulus clouds and severe storms, and the mesoscale and macroscale dynamics of the free atmosphere. A number of special facilities support this research and the associated teaching program. These resources include a unique and extensive collection of meteorological and related data in computer card and magnetic tape form, a continuously operating surface energy budget station, mobile micro-meteorological facilities, access to the United States Weather Bureau upper air sounding and radar facilities, and the facilities of the National Center for Atmospheric Research. Mutually beneficial exchange in both research and teaching exists between this department and the Graduate Center for Cloud Physics Research on the Rolla Campus.

A limited number of fellowships, scholarships, research assistantships, and teaching assistantships are available to qualified graduate students. These awards are on a competitive basis within the department, within the University, and in some cases, on a national level. Students interested in tentative programs of study and research, and application forms for fellowships, scholarships, and assistantships should

write the Chairman, Atmospheric Science Department, 701 Hitt Street.

MASTER'S PROGRAM

To be considered for acceptance, a student should have a Bachelor's degree, preferably in the physical or mathematical sciences. The undergraduate program should include mathematics through integral calculus and at least one year of college physics. Additionally, a student should present two references from faculty and acceptable scores on the GRE. Acceptance is based on a combined appraisal of the undergraduate grade point average with consideration given to grade trends, performance in major area, class rank, experience, and his potential to do graduate-level work.

To satisfy degree requirements, a student must complete 30 hours of graduate credit, in accordance with regulations given in this bulletin for Master's degrees. There is no language requirement. A candidate must submit an acceptable thesis. A final examination covering the thesis and other graduate work completes the requirements. This is generally both written and oral; however, in the event that the Master's degree is considered a terminal degree, the written portion may be waived.

THE DOCTORAL PROGRAM

All students entering the graduate degree program on the doctoral level must have a Master's degree from an accredited institution having the same basic Master's requirements as UMC. Students presenting Master's degrees from other institutions are required to take the written qualifying examination. It is recommended that Master's graduates from UMC should have their written and oral Master's examination accepted in lieu of the Ph.D. qualifying examination.

In addition to the general requirements concerning course work, residence, dissertation, and exams given in this bulletin governing the Ph.D. degree, a candidate must fulfill the following language and collateral field requirements before admittance to his comprehensive examinations: (1) He is required to demonstrate a reading ability in one language other than English containing a significant amount

of scientific literature in the field, with German, French, Japanese, Chinese, and Russian always acceptable. This language requirement may be satisfied by passing the ETS examination or by completing 12 hours of credit in the chosen language with a grade of at least C or by being a citizen and resident of a country where an acceptable foreign language is the native tongue. (2) He must complete one collateral field acceptable to his advisory committee. Normally acceptable for the collateral field is: a second foreign language or 9 hours of graduate credit in computer science or 9 hours of statistics passed with a grade of at least B.

BIOCHEMISTRY

OWEN J. KOEPPE, Ph.D., University of Illinois.
Chairman; Prof.

JOHN M. FRANZ, Ph.D., University of Iowa.
Director of Graduate Studies; Assoc. Prof.

BENEDICT J. CAMPBELL, Ph.D., Northwestern University. Prof.

THOMAS D. LUCKEY, Ph.D., University of Wisconsin. Prof.

BOYD L. O'DELL, Ph.D., University of Missouri-Columbia. Prof.

HARRY D. BROWN, Ph.D., Columbia University.
Assoc. Prof.

MILTON S. FEATHER, Ph.D., Purdue University.
Assoc. Prof.

CAMILLO A. GHIRON, Ph.D., University of Utah.
Assoc. Prof.

ARLENE P. MARTIN, Ph.D., University of Rochester. Assoc. Prof.

EZIO A. MOSCATELLI, Ph.D., University of Illinois. Assoc. Prof.

MARIE L. VORBECK, Ph.D., Cornell University.
Assoc. Prof.

ARNOLD A. WHITE, Ph.D., Georgetown University. Assoc. Prof.

ROBERT L. WIXOM, Ph.D., University of Illinois. Assoc. Prof.

WILLIAM D. NOTEBOOM, Ph.D., University of Illinois. Asst. Prof.

BERYL J. ORTWERTH, Ph.D., University of Missouri-Columbia. Asst. Prof.

DAVID B. SHEAR, Ph.D., Brandeis University.
Asst. Prof.

The Department of Biochemistry offers graduate study leading to the degrees of Master of Science and Doctor of Philosophy in Biochemistry. Graduate programs are designed to prepare students for professional careers as biochemists and bio-

physicists in industry, research institutes, or teaching.

Almost every aspect of biochemistry and certain aspects of molecular biophysics are represented in the research interests of the faculty. Students are given a major role in the choice of research advisers. The areas of concentration include enzyme reaction mechanisms, peptide synthesis, hormonal control mechanisms, growth factor identification, photochemistry of proteins and nucleic acids, developmental biochemistry, comparative biochemistry, lipid metabolism, membrane chemistry, muscle contraction, biochemistry of cancer, induced enzymes, metal ion interaction with proteins, mineral metabolism, biochemistry of the eye, and nutrition.

The department has laboratories located in the Medical Sciences Building of the University of Missouri-Columbia Medical Center, in Ellis Fischel Cancer Hospital, in the Space Sciences Research Center, and in the Missouri Institute of Psychiatry in St. Louis. These laboratories provide constant temperature rooms, an oven and furnace room, a balance room, radioactivity counting areas, and tissue culture laboratories; additionally, they provide analytical and preparative ultracentrifuges, scintillation counters, recording spectrophotometers, an amino acid analyzer, and a microcalorimeter. An excellent library and animal quarters are available.

All students will gain experience in presenting biochemical principles to individual students and to seminar groups. This supervised teaching experience is correlated with course work and creative research in programs individually planned for each student. Students are expected to complete courses in selected areas of modern biology and chemistry as well as in biochemistry.

Various types of assistantships and fellowships are available each semester and most students receive financial support. Write the Director of Graduate Studies, Department of Biochemistry, Room M-121, Medical Sciences Building for forms for financial aid and admission to the departmental programs.

DEGREE REQUIREMENTS

The department requires an applicant to complete the departmental application

forms and to submit other information including letters of recommendation on forms supplied, and official transcripts. The information is considered as a whole and rated by a departmental committee. Graduate students are accepted for programs in August, January, and June.

MASTER'S DEGREE

Prerequisites to acceptance for the M.S. program are Biology (at least one course), Mathematics through Differential and Integral Calculus, Physics (one year including some laboratory), General Chemistry, Quantitative Inorganic Analysis, Organic Chemistry (10 semester hours with laboratory), and Physical Chemistry (one year including some laboratory). These prerequisites must be met before any degree can be obtained. Preferably, this has been done during undergraduate studies; however, some prerequisites may be made up after acceptance as a graduate student.

The minimal departmental requirements for the M.S. are: General Biochemistry (Biochemistry 320, 322 and 305 or equivalent), Biochemistry Seminar (1), research (4), one graduate-level course beyond the prerequisites in an area outside of the department, teaching experience, and a thesis based on original research. The final Master's examination completes requirements. See also the general regulations for Master's degrees elsewhere in this bulletin.

Ph.D. DEGREE

Prerequisites to acceptance for the Ph.D. program are Qualitative Organic Analysis in addition to those stipulated above for the M.S. degree. A departmental qualifying examination is required. A transfer student with a Master's degree from another institution or from another UMC department will also be required to take a qualifying examination.

The minimal departmental requirements for the Ph.D. are: General Biochemistry (320, 322 and 305 or equivalent), Biophysics 301, Advanced Biochemistry (6 hours from a selected list of courses), Seminar (4), Biology (courses in two areas beyond the prerequisite requirements), Area Strength (6 hours of 300- or 400-level course work in one special field), teaching

experience and a thesis based on original research. The Ph.D. comprehensive and final examinations complete the requirements.

BIOLOGICAL SCIENCES

ABRAHAM EISENSTARK, Ph.D., University of Illinois. Director; Prof.

ROGER M. DEROOIS, Ph.D., University of California. Assoc. Director; Prof.

ERNEST G. ANDERSON, Ph.D., Cornell University. Visiting Prof.

RICHARD O. ANDERSON, Ph.D., Michigan State University. Asst. Prof.

ROBERT P. BREITENBACH, Ph.D., University of Wisconsin. Prof.

RUSSELL V. BROWN, Ph.D., Iowa State University. Assoc. Prof.

ALLAN B. BURDICK, Ph.D., University of California. Prof.

ROBERT S. CAMPBELL, Ph.D., University of Michigan. Prof.

LINDA CHAPMAN, Ph.D., University of California at Los Angeles. Asst. Prof.

EDWARD H. COE, JR., Ph.D., University of Illinois. Prof.

CLINTON H. CONAWAY, Ph.D., University of Wisconsin. Prof.

EVERETT DOUGLAS, Ph.D., University of California. Asst. Prof.

DAVID B. DUNN, Ph.D., University of California at Los Angeles. Prof.

WILLIAM H. ELDER, Ph.D., University of Wisconsin. Prof.

DONALD J. FARISH, Ph.D., Harvard University. Asst. Prof.

JOHN N. FARMER, Ph.D., Iowa State University. Prof.

WARREN R. FLEMING, Ph.D., University of Oregon. Prof.

LEIGH FREDRICKSON, Ph.D., Iowa State University. Asst. Prof.

W. REID GOFORTH, Ph.D., University of Missouri-Columbia. Asst. Prof.

CHARLES S. GOWANS, Ph.D., Stanford University. Prof.

JOHN A. GRUNAU, Ph.D., Cambridge University. Asst. Prof.

ARTHUR P. HARRISON, Ph.D., University of Maryland. Prof.

DONALD H. HAZELWOOD, Ph.D., Washington State University. Assoc. Prof.

GARY Y. KIKUDOME, Ph.D., University of Illinois. Assoc. Prof.

CLAIR L. KUCERA, Ph.D., Iowa State University. Prof.

JACOB LEVITT, Ph.D., McGill University. Prof.

WILLIAM Q. LOEGERING, Ph.D., University of Minnesota. Prof.

ALBERT E. LONGLEY, Ph.D., Harvard University. Visiting Prof.

DAN MERTZ, Ph.D., University of Texas. Assoc. Prof.

DEAN E. METTER, Ph.D., University of Idaho. Assoc. Prof.

CHARLES D. MILES, Ph.D., University of Indiana. Asst. Prof.

MYRON G. NEUFFER, Ph.D., University of Missouri-Columbia. Prof.

OM P. SEHGAL, Ph.D., University of Wisconsin. Assoc. Prof.

WILLIAM F. SHERIDAN, Ph.D., University of Illinois. Asst. Prof.

M. WESLEY SORENSON, Ph.D., University of Missouri-Columbia. Assoc. Prof.

JOHN W. TWENTE, Ph.D., University of Michigan. Assoc. Prof.

ARTHUR WITT, JR., Ph.D., University of Missouri-Columbia. Assoc. Prof.

JOSEPH M. WOOD, Ph.D., University of Indiana. Assoc. Prof.

ARMON F. YANDERS, Ph.D., University of Nebraska. Dean, College of Arts and Science; Prof.

The Division of Biological Sciences offers programs of graduate study leading to the degrees of Master of Science for Teachers of Biology (described elsewhere in this bulletin), Master of Arts, and Doctor of Philosophy. Programs in the Division of Biological Sciences are designed to prepare students for advanced professional careers in the fields of botany, genetics, microbiology, and zoology, as well as in the areas of wildlife management and research.

Application should be made to the Director of Graduate Studies for the program desired. Complete applications consist of the UMC form ("Application for fellowship . . ."), transcripts, letters of recommendation and scores on the Graduate Record Examinations (Aptitude and Biology). Application for admission to the Graduate School should be made concurrently. Because many students will pursue teaching careers, all candidates for graduate degrees must have regular teaching experience during their tenure of graduate studies.

To satisfy requirements for the degree of Master of Arts, a student must have completed the course requirements for the Division of Biological Sciences undergraduate degree. Students entering the

M.A. program who received their undergraduate degrees elsewhere or who, for any other reason, may not have completed these requirements, are expected to satisfy them in the initial stages of their graduate training.

Acceptance of a student to commence work on a Ph.D. program is based upon a combination of the following criteria: (1) consideration is given to academic background, grade average, maturity, experience, and other factors bearing upon probable success in the program; and (2) acceptable performance on the GRE. A student is formally accepted for a Ph.D. program at the time he is admitted to candidacy. To be admitted to candidacy for a Ph.D. degree, a student must successfully complete a written and/or oral qualifying examination conducted by an advisory committee.

Graduate students in the Division of Biological Sciences may apply for fellowships, traineeships, and teaching and research assistantships. These are funded by University funds and from federal and other granting agencies; research assistantships are financed through grants awarded to individual faculty members. Applications for financial assistance should be submitted to the Director of Graduate Studies.

Degree requirements of the Graduate School are provided elsewhere in this bulletin.

Special facilities for graduate study in the Division of Biological Sciences include: (1) a new, modern building, including an Electron Microscope laboratory, radioisotope laboratories, and several controlled-environment chambers and rooms; (2) a new, modern, research greenhouse; (3) a 150,000 specimen herbarium with areas of specialization in desert ecology, agrostology and the genera *Crataegus*, *Lupinus*, and *Quercus*; (4) a 14-acre botany preserve, located on the campus, with many native woody plants; and (5) a 160-acre prairie research station within 20 miles of the Columbia Campus.

The Division of Biological Sciences also maintains: (1) a marine aquarium for marine invertebrates; (2) a collection of preserved fish with some 25,000 specimens, including about 3,000 fresh and saltwater fish from Thailand; the remain-

der are freshwater fish principally from Missouri and the Midwest and saltwater fish from the Atlantic, Pacific, and Gulf coasts; (3) a herpetology collection of some 5,000 specimens of U.S. amphibians and reptiles and 2,000 more from around the world; (4) extensive teaching and research collections of vertebrate animals of Missouri; and (5) on public display in Lefevre Hall, the Glen Smart Bird Collection of over 100 species of mounted waterfowl of the world.

At the Gaylord Laboratory at Puxico in Southeast Missouri, the Division of Biological Sciences utilizes the Missouri Duck Creek Wildlife Refuge, where graduate students, many with research assistantships, do field and laboratory research under the direction of a resident research director. The field research primarily involves observations of animals in large pens built to simulate the natural habitat of waterfowl, swamp rabbits, raccoons, and other animals. Some of the current research projects involve behavioral and population dynamic research of waterfowl and research in mammalian reproduction in relation to pesticides. Generally, the research leads to a thesis or dissertation. Additional pen facilities and ponds for research and observation are available at the Ashland Wildlife Area.

Other basic research facilities in the Division of Biological Sciences include culture rooms for microorganisms (including especially algal species), an X-ray unit, ultracentrifuges, spectrophotometers, freeze drying units, and electrophoresis units. The L. J. Stadler Memorial Library contains an extensive collection of classic and contemporary papers on biological disciplines.

(A) PROGRAM LEADING TO A GRADUATE DEGREE IN BOTANY (Joseph M. Wood, Director of Graduate Studies, 213 Tucker Hall)

Programs in botany are designed to prepare students for advanced professional careers in botany or microbiology. Opportunities for graduate study are provided in the areas of microbiology, cytology, ecology, genetics, microbial physiology and biochemistry, mycology, paleobotany, plant anatomy, plant growth and develop-

ment, plant physiology, systematics, and others.

The botany program of graduate study offers degrees of Master of Arts either without thesis or with thesis, and the Doctor of Philosophy. To complete requirements for a Master of Arts without thesis, a student must complete a minimum of 40 semester hours of graduate course work, including a minimum of 5 and a maximum of 8 hours in Problems 400, under the guidance of at least two different faculty members. The comprehensive examination may be written and/or oral.

The Master of Arts degree without thesis is designed for students who do not have sufficient background in the physical sciences to undertake a degree program requiring a thesis, and it is generally considered to be a terminal degree. The program is arranged for each student on the basis of his background, career goals, and needs.

To satisfy requirements for the degree of Master of Arts with thesis, a student must have completed the requirements for the undergraduate degree. For the botany emphasis, undergraduate requirements are: mathematics through calculus (8-10 hours); one year of physics (8-10 hours); chemistry through organic chemistry with laboratory (20-25 hours); general botany and general zoology, or a year of general biology (8-10 hours); and beginning courses in any of two of the areas of systematics, anatomy and/or morphology, cytology, ecology (6-8 hours). For the microbiology emphasis, undergraduate requirements are: mathematics through calculus (6-8 hours); one year of physics (8-10 hours); chemistry through organic chemistry with laboratory (20-25 hours); general botany, general zoology, or general biology (4 hours); beginning courses in genetics, physiology, and microbiology, including laboratory training in each (12-15 hours); and specified electives (12-16 hours).

Additionally, the student must complete 32 hours of graduate course work, including 15-16 hours in 400-level courses, present an acceptable thesis on a topic approved by the student's adviser, and pass a final examination covering the student's graduate work.

To fulfill requirements for the Ph.D. degree, a student must (1) complete the course requirements for the botany or microbiology undergraduate program, (2) complete a program of study approved by the student's Advisory Committee, (3) successfully complete the comprehensive examination, (4) present an acceptable doctoral dissertation on a topic approved by the student's Advisory Committee and defend it in a final examination, and (5) comply with residence requirements and other regulations for completing the degree of Doctor of Philosophy.

(B) PROGRAM LEADING TO A GRADUATE DEGREE IN GENETICS

(Edward H. Coe, Jr., Director of Graduate Studies, 207 Curtis Hall)

The graduate program in genetics is designed to provide broad, individualized training in biology with emphasis in genetics, and to prepare graduates for research and teaching careers in genetics and related disciplines.

The field of genetics by nature is interdisciplinary, drawing concepts and techniques from other areas of biology and from chemistry, physics and mathematics; and by nature multi-organismal, drawing from and contributing to biological knowledge in microbes, higher plants, higher animals, and man. Applicants for entry into graduate study thus are expected to have one or more courses in each of the following: organic chemistry, physics, mathematics (preferably through the calculus), and statistics. Deficiencies in these subjects will be remedied promptly after admission.

At the beginning of the first semester, all students are required to take a qualifying examination. This examination will be used to aid in advising the student and in guiding his program. Applicants with a *B* average or equivalent in the most recent two years of course work, particularly in the sciences, will be considered; under special circumstances others may be considered for admission on a probationary basis.

Minimum requirements for the M.A. degree in the field of genetics are: Genetics 240 and 241 (no-credit status); ad-

vanced genetics coursework; biochemistry; seminar, 2 hours; and a thesis (or, on approval of the Graduate Education Committee, credit in Genetics 400, Problems, may be substituted). Thesis subject and other course work are determined with the adviser.

Minimum requirements for the Ph.D. degree are: Genetics 240 and 241 (no-credit status); advanced courses in genetics; biochemistry; advanced courses in physiology and metabolism; seminar, 3 hours; teaching experience; and a thesis. Other advanced courses, language requirements, and research are prescribed by the Advisory Committee.

(C) PROGRAM LEADING TO A GRADUATE DEGREE IN ZOOLOGY

(Arthur Witt Jr., Director of Graduate Studies, 106 Stephens Hall)

Graduate programs in the field of zoology are designed to prepare students for professional careers in specific areas, such as, comparative endocrinology and physiology, limnology, mammalogy, parasitology, invertebrate zoology, herpetology, comparative ethology, ecology, game and fisheries management, ornithology, ichthyology, and comparative vertebrate reproduction.

For the zoology degree, undergraduate requirements include general biology or general zoology, general genetics, physiological zoology, and a minimum of four additional courses with at least one course in the morphological area and one course in the ecological area to total 28-30 hours. Deficiencies in these areas will be remedied promptly after admission.

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. However, to be accepted into the M.A. program in Biological Sciences (Zoology) an applicant should have a 2.75 overall GPA ($A=4$) and perform acceptably on the GRE. Degree requirements for the M.A. are 30 hours of advanced study, 15 of which must be in courses numbered 400 or higher and with no more than 12 in research and problems. Each candidate

must submit a thesis of publishable quality. Written and oral final examinations are required.

To fulfill requirements for the Ph.D. degree, a student must pass the qualifying examination for admission to the doctoral program. This examination is the same as the final written examination for the M.A. in the field of zoology at UMC. Students entering UMC at the master's level will be required to take the examination.

The required course work and language requirements are determined on an individual basis by the Advisory Committee. The comprehensive examination, both written and oral, and a dissertation are required. The final oral examination primarily covers a defense of the dissertation, but also includes the candidate's experience in zoology and research.

CHEMICAL ENGINEERING

GEORGE W. PRECKSHOT, Ph.D., P.E., University of Michigan. Chairman; Director of Graduate Studies; Prof.

L. E. MARC DECHAZAL, Ph.D., Oklahoma State University. Associate Director of Graduate Studies; Prof.

JAMES R. LORAH, Ph.D., P.E., University of Washington. Prof. Emeritus

RALPH H. LUEBBERS, Ph.D., P.E., Iowa State University. Prof.

TRUMAN S. STORVICK, Ph.D., P.E., Purdue University. Director, Themis Transport Properties Center; Prof.

VIN-JANG LEE, Ph.D., University of Michigan. Assoc. Prof.

RICHARD H. LUECKE, Ph.D., University of Oklahoma. Assoc. Prof.

LEONARD I. STIEL, Ph.D., Northwestern University. Assoc. Prof.

JOHN B. SUTHERLAND, Ph.D., P.E., University of Pittsburgh. Director of University-wide Industrial Research and Extension; Assoc. Prof.

JACK WINNICK, Ph.D., P.E., University of Oklahoma. Prof.

RICHARD M. ANGUS, Ph.D., Princeton University. Assoc. Prof.

JOHN L. SUTTERBY, Ph.D., University of Wisconsin. Asst. Prof.

The Department of Chemical Engineering offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy. Areas of study in the de-

partment are non-ideal fluid mechanics, rheology, solvent extraction, process control, adaptive control, process optimization, reaction kinetics, catalysis, solid state physics, heat transport (boiling, convective, condensation), phase equilibria, fertilizer technology, bio-oxidation, Newtonian fluid mechanics, applied mathematics to chemical engineering problems, mass transport (vibrating and non-vibrating systems), thermodynamics, transport properties of gases, heat and mass transfer, high pressure properties of liquids and gases, biological temperature control problems, biologically oriented engineering research, and biochemical engineering research.

Several large Federal grants have been received for interdisciplinary research with the departments of physics, chemistry, medicine, and other fields of engineering. These include a Department of Defense-sponsored Themis Project on the Fluid and Transport Properties Research Center, and an extensive regional program for interdisciplinary research on medical problems in which the chemical engineering department expects to participate.

One of the four excellent laboratories in the world for the study of virial equation of state and transport properties (elastic properties, viscosity and thermal conductivity) for pure components and mixtures is located in Columbia.

Studies are made to temperatures of 700°F and pressures up to 7,000 pounds per square inch. In addition, pure liquids and liquid mixtures are investigated at pressures up to 200,000 pounds per square inch. Results of these studies are used to gain new insights into liquid structures. Negative pressures are induced in liquids using an ultracentrifuge which can generate fields up to 400,000 times gravity. The liquids are observed using Schlieren optics within the ultracentrifuge.

Fundamental researches in heterogeneous catalysis, reaction kinetics, and fuel cells are currently in progress in our Kinetics Laboratory, Department of Chemical Engineering, University of Missouri-Columbia. The emphasis of our approach in catalysis research is surface physics, chemistry, solid state physics, and chemical engineering.

Computer components and electronic transducers are available for studies in adaptive control of chemical reactors and other

physical processes.

Facilities are also available (1) for studies of growth and accommodations of algal cultures in a variety of environments for closed ecological systems and water pollution control, (2) for studying formations of bubbles and drops and their vibrations as they affect mass, momentum, and heat transport, (3) for the study of interfacial tension of liquid systems, (4) for the study of boiling and convective heat transfer in centrifugal fields up to 8,500 g., and (5) for the study of convective and condensation heat transfer in and from horizontal rotating cylinders. Still and high speed camera equipment (10,000 fps) as well as an Edgerton, Germeshausen, and Grier Mini-micro flash lamp source are available for experimental studies in boiling, condensation heat transfer and other high speed phenomena. Other facilities are available for the study of vaporization of liquids from surfaces or in porous beds or to bubbles and the condensation of vapors on fixed or moving surfaces.

Qualified chemical engineering graduate students will be given access, for research purposes, to the University of Missouri Research Reactor Facility located in Columbia. The numerous adjacent laboratories are well equipped with the most modern facilities including solid state detectors, liquid scintillation units, gamma spectrometers and suitable recording equipment. In the engineering building adjacent to the chemical engineering laboratories is a low level radioisotope laboratory for tracer studies.

Available on an open shop basis is the following computer equipment: (1) an IBM 360 Model 50 with 512 K bytes of main memory, 32 million bytes of auxiliary storage, and 4 CRT displays, and (2) five EAI-RT-10 analog computers; an SEL 840-A process control computer with AID and DIA research and in addition, an IBM 360 Model 65 is available for larger research problems.

The College of Engineering Library houses the latest domestic and foreign journals specific for Chemical Engineering research. Physical Sciences research journals used in Chemical Engineering research are in the UMC Library.

Research assistantships are available to qualified students. The stipend is \$3,300

for half-time work and will permit enrollment in up to 12 hours of advanced study. NASA, NDEA, and NSF Traineeships, some Industrial and Graduate School Fellowships are also available. The applicant's academic record and research potential determine the financial assistance he is offered. A program of support for three years is offered to highly qualified Ph.D. candidates. All of these permit the student to carry a full schedule of 16 semester hours. Financial assistance for students who wish to continue their study during the Summer Session is usually available. This assistance amounts to approximately 20 per cent of the stipend for the academic year and in many cases there is full-time support for the summer session for two months.

M.S. DEGREE REQUIREMENTS

To be accepted for advisement to the graduate programs in Chemical Engineering, a student must have completed a chemical engineering undergraduate curriculum at a school accredited by the American Institute of Chemical Engineers, or its substantial equivalent, or must hold the degree of B.S. in Chemical Engineering. Graduates holding degrees in Physics, Chemistry, Applied Mathematics, and related fields may also be considered for candidacy. In general, additional course work will be required of these.

An applicant with an undergraduate GPA of 3.0 ($A=4$) during the last two years of undergraduate work may be admitted to Graduate School on a basis of this record alone. However, for admission to the Chemical Engineering Graduate Program, applicants should have a minimum of 2.75 overall GPA in undergraduate work with consideration given to grade trends, performance in the area of chemical engineering and mathematics, and other criteria bearing on a student's probable success in graduate study. Selected students with less than a 2.75 GPA may be considered on a probationary basis. Financial support is competitive and a 3.0 is required. No financial support is available for probationary students.

If a Master's candidate is accepted as a probationary student and receives C (or below) grades in 6 or more of the 12 hours taken during his first semester, he will not

be allowed to continue. If his progress is satisfactory, his status will change to that of a regularly enrolled student.

A diagnostic or screening examination must be taken before registering for the first time in the College of Engineering. This is to assist in planning the student's program for the first semester. This examination is usually given on or before the first day of registration. The Graduate School requires the GRE. If not taken before entrance, it must be taken the first semester of residence.

There is no language or collateral requirement for the Master's degree. Thirty hours including research are required. Each student will participate in seminar. The individual program prepared by consultation between the student and his adviser, and approved by the Graduate Dean, will include advanced courses in chemical engineering and mathematics, and not more than 12 hours of research or other unscheduled work. The course work and research may be oriented towards various objectives, dependent upon the considerable variety of research projects available.

A thesis is required and a Master's candidate must pass a terminal examination in defense of this thesis.

THE Ph.D. DEGREE REQUIREMENTS

In addition to the diagnostic examination required of entering students, an applicant to the Ph.D. program must pass a qualifying examination at a level sufficiently high as determined by the department to be admitted to advisement. If properly structured, the final oral examination in defense of the Master's thesis at UMC may be used as a substitute for the Ph.D. qualifying examination. Later he must also successfully pass a comprehensive examination before being admitted to candidacy and before proceeding to prepare his dissertation.

A comprehensive two-year plan of courses made in consultation with the thesis adviser is prepared for each student. If the adviser feels that one or two languages are necessary this may be included as a requirement.

At a suitable period in his progress the candidate must pass the comprehensive examination, which involves original and

creative work in delineating a research problem of some substance within a 30-day period.

Original research of high quality suitable for a Ph.D. candidate must be presented as a thesis in accordance with the rules of the Graduate School.

The Department requires a GPA of above 3.00. Usually the qualifying and comprehensive examinations are a sufficiently good screen to assure good academic performance in students.

Other regulations and requirements regarding Ph.D. degrees are presented elsewhere in this bulletin.

CHEMISTRY

DAVID E. TROUTNER, Ph.D., Washington University. Chairman; Prof.

DOROTHY V. NIGHTINGALE, Ph.D., University of Chicago. Director of Graduate Studies; Prof.

HENRY E. BENT, Ph.D., University of California. Prof. Emeritus

R. KENT MURMANN, Ph.D., Northwestern University. Prof.

NORMAN RABJOHN, Ph.D., University of Illinois. Prof.

SCOTT SEARLES, JR., Ph.D., University of Minnesota. Prof.

LLOYD B. THOMAS, Ph.D., University of Minnesota. Prof.

JOHN E. BAUMAN, JR., Ph.D., University of Michigan. Assoc. Prof.

ROBERT E. HARRIS, Ph.D., University of California. Assoc. Prof.

EDWIN M. KAISER, Ph.D., Purdue University. Assoc. Prof.

ROBERT R. KUNTZ, Ph.D., Carnegie Institute of Technology. Assoc. Prof.

RICHARD N. LOEPPKY, Ph.D., University of Michigan. Assoc. Prof.

STANLEY E. MANAHAN, Ph.D., University of Kansas. Assoc. Prof.

ELMER O. SCHLEMPER, Ph.D., University of Minnesota. Assoc. Prof.

RICHARD C. THOMPSON, Ph.D., University of Maryland. Assoc. Prof.

ANTHONY M. DEAN, Ph.D., Harvard University. Asst. Prof.

HYUNYONG KIM, Ph.D., University of California. Asst. Prof.

ROBERT MEGARGLE, Ph.D., Clarkson Institute of Technology. Asst. Prof.

JOHN R. SABIN, Ph.D., University of New Hampshire. Asst. Prof.

The Department of Chemistry offers course work leading to the degrees of Master of Arts and Doctor of Philosophy in

Chemistry. The Department, with the Departments of Physics and Mathematics, also offers graduate work leading to the degree of Master of Science in Physical Science. This degree is designed for those planning to teach in junior colleges and requires 40 hours of course work and no thesis.

The areas of concentration are Analytical Chemistry, Physical Chemistry, Inorganic Chemistry, Organic Chemistry, and Nuclear Chemistry.

The Department of Chemistry maintains well-equipped research laboratories and facilities for the four major divisions, which provide the usual standard equipment for specialized research leading to the Master's and Ph.D. degrees in these areas. In addition, there are numerous major pieces of special equipment with the Department.

Other campus facilities which are widely used by the Department include a complete spectrographic laboratory, a central instrument shop, a glass blowing shop, a large computing center, and the five megawatt Nuclear Reactor. The latter provides a high neutron flux for radioisotope and activation analysis. A Co^{60} γ -ray source for radiation damage studies is also located at the reactor. Several research laboratories are available for departmental faculty and graduate students on a continuing basis as their research requires.

NDEA and NSF Fellowships and a few industrial fellowships and research assistantships are available for highly qualified applicants. These are in addition to the departmental teaching assistantships. Application forms for these can be obtained from the Chairman of the Chemistry Department and should be submitted no later than March 1 of each year.

GRADUATE DEGREE REQUIREMENTS

A student who wishes to do graduate work in chemistry must have either an A.B. or B.S. degree in chemistry, essentially equivalent to those awarded at the University of Missouri-Columbia, with a *B* average or a score in the 70 percentile of the GRE. The prerequisite course requirements are those required for a B.S. as certified by the American Chemical Society.

The general requirements for the Master's and Ph.D. degrees are those of the Graduate School. In addition, the following regulations govern graduate work in chemistry: (1) all new graduate students are required to take departmental entrance examinations shortly before registration; (2) all new graduate students are required to take the departmental qualifying examinations over the four fields of chemistry either at the end of the first or second semester. These must be passed before a Master's degree may be awarded and before the student may apply for candidacy for the Ph.D. degree. Those who enter in the Fall with a Master's degree must take Ph.D. qualifying examinations in January.

The program for a Master's degree requires a minimum of 30 hours of graduate-level course work including 8-12 hours of research credit, passing the qualifying examinations, and an acceptable thesis. There is no language requirement. A final oral examination covering both the thesis and course work is given before the degree is awarded.

To become a candidate for the Ph.D. degree, the student must be accepted by the Chemistry Department and his course work and research program must be approved by an advisory committee; departmental acceptance is based on the student's previous course record and his performance on the qualifying examinations. Although no fixed number of hours for graduate credit is required, the candidate must have the equivalent of three years of residence credit beyond the Bachelor's degree. Teaching and other activities may extend the time required for course work and research.

In the fields of analytical, inorganic, and organic chemistry, written cumulative examinations are given beginning in the second year. The Physical Chemistry Division administers a written comprehensive examination instead of cumulatives. These written tests are followed by an oral examination which emphasizes the major field but also includes related branches of chemistry.

Before admittance to the oral examinations, the Ph.D. candidate must give satisfactory evidence of his ability to translate German normally.

The candidate must submit a dissertation which describes the results of suc-

cessful and original research in one of the branches of chemistry. After the dissertation has been accepted, there is a final oral examination, primarily in the field of the candidate's research.

CIVIL ENGINEERING

JAMES W. BALDWIN, JR., Ph.D., University of Illinois. Chairman; Director of Graduate Studies; Prof.

KARL H. EVANS, M.S.C.E., University of Illinois. Assoc. Chairman; Assoc. Prof.

KENNETH P. BUCHERT, Ph.D., University of Missouri-Columbia. Prof.

JOHN J. CASSIDY, Ph.D., Iowa State University. Prof.

RICHARD T. DOUTY, Ph.D., Cornell University. Prof.

LINDON J. MURPHY, M.S., Iowa State University. Prof. Emeritus

ADRIAN PAUW, Ph.D., California Institute of Technology. Prof.

ARLISS D. RAY, Ph.D., University of California. Prof.

HARRY RUBEY, C.E., University of Illinois. Prof. Emeritus

HARRISON D. COMINS, M.S.C.E., Lehigh University. Assoc. Prof.

LAWRENCE N. DALLAM, Ph.D., Oklahoma State University. Assoc. Prof.

MARK P. HARRIS, M.S.C.E., Georgia Institute of Technology. Assoc. Prof.

LOUIS HEMPHILL, Ph.D., University of Missouri-Columbia. Assoc. Prof.

ALLEN T. HJELMFELT, Ph.D., Northwestern University. Assoc. Prof.

DARRELL L. KING, Ph.D., Michigan State University. Prof.

CHARLES W. LENAU, Ph.D., Stanford University. Assoc. Prof.

HENRY LIU, Ph.D., Colorado State University. Assoc. Prof.

WALKER W. MILNER, M.S., Iowa State University. Prof.

CENAP ORAN, Ph.D., University of Illinois. Assoc. Prof.

HAROLD J. SALANE, Ph.D., University of Texas. Assoc. Prof.

GEORGE H. STICKNEY, Ph.D., University of Michigan. Assoc. Prof.

CHARLES WRIGHT, M.S., University of California. Assoc. Prof.

NEAL B. H. BENJAMIN, Ph.D., Stanford University. Asst. Prof.

DAVID L. GUELL, Ph.D., Northwestern University. Asst. Prof.

ROBERT MCBEAN, Ph.D., Stanford University. Assoc. Prof.

JAY B. MCGARRAUGH, Ph.D., Purdue University. Assoc. Prof.

JOHN T. NOVAK, Ph.D., University of Washington. Asst. Prof.

JOHN R. SALMONS, Ph.D., University of Arizona. Assoc. Prof.

The Department of Civil Engineering offers the Master of Science degree in Civil Engineering, the Master of Science degree in Sanitary Engineering, and the Doctor of Philosophy degree.

Major fields of study include structures and structural mechanics, hydraulics and fluid mechanics, sanitary and public health engineering, construction and management, soil mechanics and foundation engineering, and transportation and land-use planning. Students are also encouraged to take courses related to their major field of study from other departments in UMC. Faculty and students in the department maintain vigorous research activity in each of the above areas.

The Civil Engineering Department has well-equipped laboratories for experimental research in structures, sanitary engineering, soil mechanics, and fluid mechanics. As a typical example, the structural laboratory contains closed-loop-servo-controlled hydraulic loading apparatus and automatic data acquisition equipment. The department also maintains fully-equipped shop facilities with five full-time technicians.

Approximately thirty teaching and graduate research assistantships are available each year in addition to fellowships and traineeships supported by NSF, NDEA, EPA, and other governmental agencies. Half-time appointments pay \$3,300 to \$3,700 and permit the holder to take 12 credit hours per semester. This work is supported by numerous grants from governmental agencies and industry as well as by the University.

Information regarding availability of financial support, further details about departmental requirements for degree programs and course work may be obtained by contacting the Chairman, Room 150, Engineering Building.

M.S. DEGREE PROGRAMS

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on the basis of this record alone.

However, admission to the program leading to the Master of Science in Civil Engineering requires that the student have a Bachelor of Science degree in Engineering from an ECPD accredited program and an overall GPA of at least 2.5 is required of recent graduates. Special consideration may be given to applicants who have demonstrated superior performance in professional practice for a period of two or more years. The GRE must be taken prior to admission or during the first semester of enrollment.

Each of the Master's programs requires a minimum of 30 hours of credit; a minimum of 15 hours of this credit must be in courses numbered 400 or higher. At least one week prior to his final oral examination, each candidate must submit to his examining committee a thesis, a formal report, or a design of professional quality applying the knowledge gained in his course work to the solution of an engineering problem. Students who receive research appointments or traineeships are required to submit a thesis. The final oral examination is required of all Master's candidates.

DOCTOR OF PHILOSOPHY PROGRAM

Formal acceptance to candidacy for the Ph.D. degree is based on a written qualifying examination, administered during the student's first semester of post-Master's work, by faculty members in his area of concentration. In cases where students desiring Ph.D. candidacy take a Master's degree with thesis option in this department, the Master's oral examining committee conducts an oral qualifying examination concurrently with the final examination for the Master's degree.

Doctor of Philosophy programs are committee-administered programs which are tailored to fit the needs of each individual student; specific requirements are held to a minimum to allow as much flexibility as possible. Candidates are required to complete a minimum of two years of course work and one year of research beyond the Bachelor's degree. One year of credit is given for the Master of Science degree and the second year comprises approximately 30 credit hours of additional

course work. The candidate must show proficiency in two languages, or one language and one collateral field. After the candidate has essentially completed his course work and satisfied the language requirements, he must pass a comprehensive oral examination before continuing work on a dissertation. This examination is administered by a committee appointed by the Graduate School Dean. Each candidate is required to submit a dissertation, embodying the results of original investigation, which is satisfactory to his adviser and his final examination committee. The candidate must defend the dissertation at a final oral examination conducted by the final examining committee and open to the faculty.

CLASSICAL STUDIES

JOHN C. THIBAUT, Ph.D., University of Illinois. Chairman; Prof.

ROBERT J. ROWLAND, Ph.D., University of Pennsylvania. Director of Graduate Studies; Assoc. Prof.

MEYER REINHOLD, Ph.D., Columbia University. Prof.

EUGENE N. LANE, Ph.D., Yale University. Assoc. Prof.

CHARLES F. SAYLOR, Ph.D., University of California. Assoc. Prof.

THEODORE A. TARKOW, Ph.D., University of Michigan. Asst. Prof.

The Department of Classical Studies offers graduate work leading to the degrees of Master of Arts in Classical Languages, Master of Arts in Latin, Master of Arts in Greek, Master of Arts for Teachers of Latin, and Doctor of Philosophy in Classics and Classical Archaeology jointly with the Department of Art History. The M.A. in Classical Languages is normally the degree taken by students who intend to continue to the Ph.D. degree.

Graduate programs in Classical Studies are designed to prepare students for professional careers as teachers and scholars of Classical Literature and Ancient Civilization. In addition to acquiring expertise in the traditional classical disciplines, students are encouraged to acquire some familiarity with other areas, such as later literatures and cultures, on which the classical tradition has exercised a decided effect. At the end of their graduate work, it is

consequently hoped, though not required, that students will be academically equipped to ask new questions of the Classics, thereby broadening both their teaching and research perspectives.

Since the University of Missouri-Columbia is a contributing member of the American Academy in Rome and the American School of Classical Studies in Athens, their facilities are available to graduate students from Missouri. It is often feasible to study in Athens or Rome after completing the work for a Master's degree. On campus, the student has at his disposal the facilities of the main library which are excellent in the major fields of Greek and Latin literature as well as in the various ancillary fields. The UMC Library's collection is supplemented by the Walter Miller collection in one of the Department offices. The Museum of Art and Archaeology also contains much that is of interest to classicists.

MASTER OF ARTS DEGREE PROGRAMS

The basic minimum requirements for admission to the M.A. program are an A.B. degree from an accredited college or university with a reading knowledge of Greek and/or Latin and a GPA of at least 3.0 ($A=4.0$) or the equivalent during the last two years of undergraduate work.

The minimum course of study requirements for the degree are 30 hours of course work, of which at least 15 must be at the 400 level, in Greek, Latin, Classics, and related fields; 10-12 hours should be in courses in other departments. The precise details of the student's program will be worked out by the student and his adviser.

For an M.A. in Latin, the student must offer at least 18 hours in Latin and Classics; for an M.A. in Greek, the student must offer at least 18 hours in Greek and Classics; for an M.A. in Classical Languages, the student must offer at least 18 hours in Latin, Greek, and Classics.

A student may minor in a related field or he may spread his related work over several areas. A minor shall consist of no less than 10 hours and no more than 12 hours.

The Introduction to Graduate Study in Classics (Classics 409) will be required of

all students in their first year of graduate study.

It is recommended that each student pass a course in Greek Stylistics or in Latin Stylistics. During his first month of graduate study the student should meet with his adviser and plan his reading list, consisting of works in translation and in the original which pertain to the student's major interests. An examination on the reading list will be part of the final examination for the degree.

The thesis may be waived for reasonable cause, in which case six hours of course work will be substituted in its stead. If a thesis is to be written, the topic shall be chosen in consultation with the student's adviser. The subject of the thesis should be limited so that students can demonstrate familiarity with the bibliography in the field, critical and organizational abilities, and facility in writing in a scholarly manner. A draft of the thesis must be submitted to the adviser at least two months before the final draft is due. The final draft of the thesis must be acceptable to at least three readers, one of whom will be the student's adviser.

An hour-long final oral examination will be given by a faculty Board. If a thesis has been submitted, this examination will include defense of the thesis and general questions within fields related to the thesis. The examination cannot be administered during the summer session; the deadline date is in this bulletin.

THE M.A.T. DEGREE

The degree of Master of Arts for Teachers is designed to meet the needs of the secondary school teacher and the prospective secondary teacher of Latin and for this reason does not propose to be a step toward the Ph.D. as does the traditional M.A. However, some of the work required for the degree would be applicable to the Ph.D. if the candidate should later elect to continue his studies.

Course work for the degree may be completed either during a combination of academic year and summer sessions, or during summer sessions alone.

An A.B. degree from an accredited institution with a background in Classics satisfactory to the department, either from

college work or from teaching experience, is required for admission to the program. A candidate for the degree should hold a permanent teaching certificate in the State of his residence before beginning work on the degree. If he does not hold such a certificate, he will be expected to fulfill requirements for such certification before the degree is awarded and in addition to the requirement of 30 hours.

The student will be required to complete the following courses unless he can demonstrate to the department that he has already mastered their content: Latin Stylistics (2 hours); Advanced Study in the Techniques of Teaching Classics (3 hours); classroom teaching experience or Education D125 is a prerequisite; at least one 400-level course in Latin or other approved course; at least 6 hours at the 200-level or higher in Classics courses in English; and an additional 3-12 hours in Classics courses in English and/or related courses outside the department (Roman history is required). The student may not offer 200-level courses in Latin. No more than 9 hours at the 200 level will be accepted.

No thesis is required for this degree; however, upon completion of 30 hours of course work, the student will be expected to pass an examination covering translation from the Latin language, the history of Latin literature, and Roman history, with emphasis on the periods of Cicero and Vergil.

PH.D. DEGREE IN THE AREA OF CLASSICS AND CLASSICAL ARCHAEOLOGY

The minimum requirements for admission to the Ph.D. program include: (1) an A.B. degree from an accredited college or university with reading knowledge of Greek and/or Latin; (2) sufficient reading knowledge of German and/or French (or, in justifiable instances, Italian).

The minimum course of study requirements for the degree are: (1) in the Classical Studies, 36-42 hours at the 300 and 400 level, of which 6 should be in Greek Stylistics and in Latin Stylistics, and 3 in Classics 380; (2) in addition to formal course work, the student must offer at least 8 hours of dissertation credit; (3) in addition to his work in the classical languages

and literatures, the student should pass with a grade of *A* or *B* at least 24 hours of graduate-level courses outside the major department, of which at least 15 must be in one department, field, area, or program. The precise details of the student's program will be worked out by the student and his adviser. One course (at least) in Classical Archaeology must be taken at some time during the student's program.

Though some command of German and/or French (or Italian) is necessary from the very beginning, students are required to have passed both E.T.S. Foreign Language Examinations by final registration for their third year of graduate study.

By the beginning of his second year, the student should ask his adviser to officially recommend a five-man Advisory Committee to administer a departmental qualifying examination. This examination will be in two parts. The written examination (three hours) consists of translations of passages from Greek and Latin literature, based on a reading list composed by the student and his adviser. The oral (approximately one hour) consists of an examination in the major authors and works of the classical periods of Greek and Latin literature. After successful completion of the qualifying examination, the student should meet with his advisory committee to plan the remainder of his program of study. Completion of the qualifying examination with a passing grade, and approval of the program of study and research by the advisory committee and the Dean constitutes acceptance as a candidate for the Ph.D. degree.

After the successful completion of residence, language, and course requirements, the student must pass the comprehensive examinations which will consist of five 3-hour examinations in the following fields: (1) Greek literature, (2) special author (Greek), (3) Latin literature, (4) special author (Latin), and (5) minor field.

The student should then complete a dissertation and have it approved according to regulations. The candidate must furnish to the Department of Classical Studies a bound copy of the dissertation.

The student should pass a final oral examination (approximately two hours) on the thesis of the dissertation and on related subjects.

The student should refer to the Regulations concerning Ph.D. degrees for procedural and other information.

COMMUNITY HEALTH AND MEDICAL PRACTICE

COMMUNITY HEALTH

LESTER E. WOLCOTT, M.D., University of Buffalo. Chairman; Prof.

A. SHERWOOD BAKER, M.D., University of Illinois. Prof.

WILLIAM D. BRYANT, Ph.D., New York University. Prof.

EDWARD W. HASSINGER, Ph.D., University of Minnesota. Prof.

CARL J. MARIENFELD, M.D., University of Illinois. Prof.

ARTHUR E. RICKLI, M.D., University of Illinois. Prof.

HANS O. MAUKSCH, Ph.D., University of Chicago. Prof.

PAUL O. BOYLE, D.D.S., University of Illinois. Assoc. Prof.

CHARLES C. MIDDLETON, D.V.M., University of Missouri-Columbia. Assoc. Prof.

WILLIAM C. ALLEN, M.D., University of Nebraska. Assoc. Prof.

DONALD C. BLENDEN, D.V.M., University of Missouri-Columbia. Assoc. Prof.

C. RICHARD DORN, D.V.M., Ohio State University. Assoc. Prof.

JAMES O. PIERCE, M.S., University of Cincinnati. Assoc. Prof.

LLOYD A. SELBY, D.V.M., Colorado State University. Assoc. Prof.

GERALD R. CHASE, Ph.D., Stanford University. Assoc. Prof.

H. DENNY DONNELL, Jr., M.D., Washington University. Asst. Prof.

WILLIAM B. NESER, M.S.P.H., University of Missouri-Columbia. Asst. Prof.

HERBERT I. SAUER, M.S.P.H., University of Missouri-Columbia. Asst. Prof.

LYNFORD L. KEYES, M.P.H., University of North Carolina. Clinical Asst. Prof.

ROBERT W. CHESTER, M.S.P.H., University of Missouri-Columbia. Instr.

WILLIAM E. JOHNSON, M.S.P.H., University of Missouri-Columbia. Instr.

HARLEY T. WRIGHT, M.S.P.H., University of Missouri-Columbia. Instr.

GORDON T. RUDE, M.P.H., U.C.L.A. Clinical Instr.

RICHARD M. GRIMES, M.B.A., University of Michigan. Research Assoc.

The master's program in Community Health consists of a 32-hour program of graduate credit leading to the degree of Master of Science in Public Health. It includes a combination of research and/or field experience. Original research leading to a formal thesis is required in some elective areas. Various course requirements are designed to cover the specialized content necessary for professional practice in particular areas of public health. A minimum of 9 to 11 months of full-time enrollment must be anticipated by the student.

The requirements for the degree are those established by the Graduate School, the Department of Community Health and Medical Practice, and the elective areas of concentration. At present, the elective areas of concentration are: public health administration, veterinary public health, and epidemiology. Other areas, currently being developed, are community health education and environmental health sciences.

In order to qualify for admission, an applicant must present: (1) a prior doctoral degree from an approved school or (2) a Bachelor's degree, having maintained a 3.0 grade point average ($A=4$) in the final two years of academic work. Those submitting Bachelor's degrees must also take the Graduate Record Examination, available several times a year from the Educational Testing Service, Princeton, N.J. The applicant must also submit two satisfactory letters of recommendation.

While the above minimum qualifications must be met, other factors such as work experience in a health related field, additional information regarding the applicant's ability or a personal interview will be considered before a final decision on the application is made by the Admissions Committee.

HEALTH SERVICES MANAGEMENT

JON A. KLOVER, M.S.P.H., U.C.L.A. Director of Graduate Studies; Asst. Prof.

DONALD S. HOLM, JR., Ph.D., University of Indiana, Prof.

J. BARTON BOYLE, M.B.A., University of Chicago. Asst. Prof.

JAMES A. IRVIN, Ph.D., University of Missouri-Columbia. Asst. Prof.

KENZO KIKUNI, M.S.H.A., Northwestern University. Visiting Asst. Prof.

ROBERT J. LAUR, Ph.D., University of Minnesota. Asst. Prof.

EDWIN W. PARKHURST, JR., M.B.A., University of Chicago. Asst. Prof.

BRUCE M. PERRY, M.B.A., Cornell University. Asst. Prof.

WARREN A. THOMPSON, Ph.D., University of Missouri-Columbia. Asst. Prof.

MICHAEL A. WEST, M.H.A., University of Minnesota. Asst. Prof.

CHARLES M. EDWARDS, M.H.A., Washington University. Clinical Asst. Prof.

WARREN S. HINTON, M.A., St. Louis University. Clinical Asst. Prof.

WOODROW W. LEE, M.H.A., University of Minnesota. Clinical Asst. Prof.

HAMILTON V. REID, M.H.A., University of Minnesota. Clinical Asst. Prof.

GEORGE H. YECKEL, M.S.H.S., Northwestern University. Clinical Asst. Prof.

HERMAN S. BAIN, M.H.A., Baylor University. Instr.

J. STEPHEN FERGUSON, M.A., University of Iowa. Instr.

HAROLD KANE, M.A., University of Missouri-Columbia. Instr.

LARRY F. MCFALL, M.H.A., Georgia State University. Instr.

JAMES L. DACK, M.B.A., University of Chicago. Clinical Instr.

ROBERT J. GUY, B.A., Emory. Clinical Instr.

JOSEPH F. HARKINS, M.P.A., University of Kansas. Clinical Instr.

CHARLES C. LINDSTROM, M.H.A., University of Minnesota. Clinical Instr.

RUSSELL H. MILLER, M.H.A., University of Minnesota. Clinical Instr.

JAMES R. RICH, M.H.A., Washington University. Clinical Instr.

The University of Missouri-Columbia Graduate Studies in Health Services Management offers the degree of Master of Science in Public Health and an area of concentration for an M.B.A. and an M.S. in Public Administration with the School of Business and Public Administration.

It is recommended, but not required, that those with strong backgrounds in medicine, public health, and the basic sciences enter the program leading to the M.B.A. or M.S.P.A. degree, while those with Bachelor's degrees in Business Administration or the equivalent should enroll in the M.S.P.H. curriculum. This approach allows the student to supplement rather than duplicate his previous training and experience.

The program in Health Services Management requires two years of academic work with the intervening summer utilized to provide a three-month externship in a hospital or health agency. The program requires a total of 60 hours with no language or collateral requirements.

The program's close affiliation with the Missouri Hospital Association, Missouri Regional Medical Program, and its clinical faculty composed of key hospital administrators throughout the State provides a wide variety of educational opportunities for students.

An applicant with an undergraduate GPA of at least 3.0 ($A=4$) or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. However, to be accepted for advisement in this program, an applicant, in earning a baccalaureate, master, or doctoral degree, must also have maintained an overall grade average of at least 2.5. It is suggested that those entering the M.B.A. program have three hours of behavioral science and three hours of mathematics as part of their undergraduate training. Those desiring admission to the M.S.P.A. program should have at least six hours of upper-level course work in political science with at least a 2.75 grade average. In the selection process for each program, more emphasis is placed on sound scholarship and the promise of development for the field than on the precise content of the program which the prospective student has followed before applying to study in health services management.

All applicants to the program must take a Miller Analogies Test. The Admission Test for Graduate Study in Business must be taken by all M.B.A. applicants, the Graduate Record Examination by all M.S.P.A. applicants, and those with marginal academic records must submit a score on either of these tests for evaluation purposes prior to admission to the M.S.P.H. program. Students with superior academic records, who may be accepted into the M.S.P.H. curriculum without a test score, will be asked to take the examination during the first semester of the academic year following admission for purposes of counseling.

DAIRY HUSBANDRY

HAROLD D. JOHNSON, Ph.D., University of Missouri-Columbia. Chairman; Director of Graduate Studies; Prof.

CHARLES W. TURNER, Ph.D., University of Wisconsin. Prof. Emeritus

JOHN R. CAMPBELL, Ph.D., University of Missouri-Columbia. Prof.

CHARLES P. MERILAN, Ph.D., University of Missouri-Columbia. Prof.

FRED H. MEINERSHAGEN, M.S., University of Missouri-Columbia. Prof.

RALPH R. ANDERSON, Ph.D., University of Missouri-Columbia. Assoc. Prof.

FREDRIC A. MARTZ, Ph.D., Purdue University. Assoc. Prof.

JOHN D. SIKES, Ph.D., University of Missouri-Columbia. Assoc. Prof.

LAURENCE W. HEDLUND, Ph.D., University of Pittsburgh. Asst. Prof.

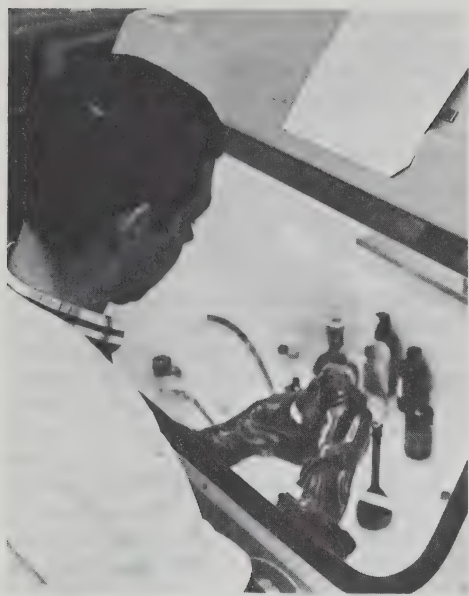
REX E. RICKETTS, Ph.D., University of Missouri-Columbia. Asst. Prof.

The Department of Dairy Husbandry offers graduate study leading to the degrees of Master of Science and Doctor of Philosophy in Dairy Husbandry. Additionally, faculty members participate in the Area Programs of Nutrition and Physiology which offer Ph.D. degrees. Those programs are described elsewhere in this bulletin.

Graduate programs in Dairy Husbandry are designed to prepare students for advanced professional scientific careers in the fields of dairy production, physiology, endocrinology, nutrition and reproductive physiology. Students trained in Dairy Husbandry go not only into positions in Agriculture but also into research in the fields of medical science, space science, and biological science.

The M.S. degree will prepare a student for a position in industry, teaching or agricultural extension, and will also provide training toward the Ph.D. Among others, the areas of research include dairy cattle management, dairy production, nutrition, environmental physiology, endocrinology, lactation physiology and reproductive physiology. The Ph.D. program is designed to prepare students for research in various fields and for college and university teaching.

The Department of Dairy Husbandry cooperates closely with all phases of the dairy industry, both state and national. The



University farms and herds offer many opportunities to students interested in relating their studies to problems of the industry. Special facilities for research in Dairy Husbandry include: (1) environmental physiology-climatic laboratory facilities for both large and small laboratory animals, (2) altitude chamber, (3) endocrine and nutrition facilities for digestion and lactation physiology studies on cattle, (4) special laboratories for bioassay and tracer endocrine and metabolism research, (5) special equipment for metabolism studies on a broad spectrum of species, (6) cooperative use of the Low Level Radiation Laboratory, Nuclear Reactor, Sinclair Comparative Medicine Research Farm, Space Science facilities, and the Agricultural Engineering Department thermo-electric partitioned calorimeter, (7) the Computational Services Center with consultation service for statistical analysis of research data, and (8) the Agricultural Experiment Station Chemical and Spectrographic Laboratories.

Fellowships, scholarships and teaching and research assistantships are available to qualified dairy husbandry graduate students. These forms of financial assistance are supported by funds from state and national governmental agencies, industry, and from the College of Agriculture. Applica-

tions should be submitted by March 1 each year. Additional information may be obtained from the Chairman, Department of Dairy Husbandry, College of Agriculture, 104 Eckles Hall.

THE M.S. DEGREE REQUIREMENTS

Whether the B.S. in Agriculture or some other baccalaureate degree is offered, the candidate must have included in his undergraduate work a minimum of 25 credit hours in the following specified subjects or their equivalent: Chemistry, Physics, Zoology, Bacteriology, Economics, Mathematics, Physiology, and such technical subjects as the Department may deem essential for graduate study in the branch of dairy husbandry in which the student intends to specialize. In addition, a student should show acceptable performance on the GRE, and a 3.0 or higher overall GPA ($A=4$) is recommended with consideration given to other criteria.

The degree requirements are those of the Graduate School with at least 16 of the 30-hour minimum requirement to be in 400-level courses. There is no language requirement. A candidate is required to submit a manuscript suitable for publication in a scientific journal.

Ph.D. REQUIREMENTS

To become a candidate for the degree of Doctor of Philosophy, a student must pass a qualifying examination administered by the Dairy Husbandry Department and the Advisory Committee, and/or qualify for the degree in the areas of Physiology and Nutrition.

The program for the Ph.D. degree requires as a minimum two years beyond the Master's degree or three years beyond the B.S. degree. Normally, completion of the requirements requires (1) completion of an individually arranged program of study; (2) passing of an oral and written comprehensive examination; (3) demonstration of proficiency by examination in two foreign languages, or in one foreign language and one collateral field, or in two collateral fields; (4) demonstration of ability to do original research and suitably

prepare material for publication in a scientific journal; and (5) pass a final oral examination.

Supporting fields for Dairy Husbandry are engineering, endocrinology, neurophysiology, behavioral sciences, biochemistry, chemistry, environmental physiology, metabolism, statistics, biology, nutrition, and microbiology.

ECONOMICS

PAUL E. JUNK, Ph.D., Northwestern University. Chairman; Prof.

JOHN P. DOLL, Ph.D., Iowa State University. Director of Graduate Studies; Prof.

FLOYD K. HARMSTON, Ph.D., University of Missouri-Columbia. Program Director, Research Center; Prof.

ROBERT W. PATERSON, Ph.D., University of Virginia. Acting Dean, School of Business and Public Administration; Prof.

RUSSELL S. BAUDER, Ph.D., University of Wisconsin. Prof. Emeritus

WILLIAM D. BRYANT, Ph.D., New York University. Prof.

MONA E. DINGLE, Ph.D., University of California. Prof.

STANLEY R. JOHNSON, Ph.D., Texas A & M. Prof.

DAVID R. KAMERSCHEN, Ph.D., Michigan State University. Prof.

JOHN M. KUHLMAN, Ph.D., University of Wisconsin. Prof.

MAW LIN LEE, Ph.D., University of Wisconsin. Prof.

WAYNE A. LEEMAN, Ph.D., University of Wisconsin. Prof.

ERWIN E. LIEBHAFSKY, Ph.D., University of Illinois. Prof.

CARMEN F. MENEZES, Ph.D., Northwestern University. Prof.

JOHN C. MURDOCK, Ph.D., University of Wisconsin. Prof.

PAUL E. SMITH, Ph.D., University of Michigan. Prof.

PINKNEY C. WALKER, Ph.D., University of Pennsylvania. Prof. (on leave)

WHITNEY HICKS, Ph.D., Stanford University. Assoc. Prof.

WALTER L. JOHNSON, Ph.D., Duke University. Assoc. Prof.

DAVID LOSCHKY, Ph.D., Harvard University. Assoc. Prof.

DAVID W. STEVENS, Ph.D., University of Colorado. Assoc. Prof.

RICHARD L. WALLACE, Ph.D., Vanderbilt University. Assoc. Prof.

WILLIAM L. LITTLEJOHN, M.A., University of Mississippi. Asst. Prof.

WILLIAM C. O'CONNOR, M.A., University of Montana. Asst. Prof.

DAVID D. RAMSEY, Ph.D., University of Minnesota. Asst. Prof.

The Department of Economics offers graduate work leading to the Master of Arts in Economics and the Doctor of Philosophy. The graduate program in economics educates students for careers in colleges, universities, research institutions, government, and business. As a degree candidate studies economic theory and its applications, he develops facility in economic analysis, in the interpretation of empirical data, and in the appraisal of public policy.

Fields emphasized by the Department are mathematical economics, econometrics, public finance and income stabilization, industrial organization, health and medical economics, Manpower, and urban and regional economics. Interesting work is also being done in the analysis of economic institutions.

The University of Missouri-Columbia Library has a large collection of books and current periodicals in economics—in English, German, Russian, and other languages. Faculty and students in economics have access to numerous computers including the IBM 360-65. A Research Center combines the research interests of scholars in economics, political science, sociology, public administration, and business administration.

The Missouri-Kansas Seminar in Theoretical and Applied Economics was started in 1966 by the Departments of Economics at the Universities of Missouri and Kansas. Now, departments at Iowa State, Southern Illinois, and Washington universities participate. With its primary focus on quantitatively-oriented studies, the seminar meets at intervals for discussions of faculty research. Graduate students are encouraged to attend.

An applicant for graduate study in Economics should write the Director of Graduate Studies (Economics), School of Business and Public Administration, for admission forms. At the same time he may request forms for teaching and research assistantships and for National Defense Education Act Fellowships.

Requests for application forms for National Science Foundation Traineeships and University Fellowships should be made to the Dean of the Graduate School, 205 Jesse Hall.

March 1 is the deadline for applications for the school year beginning in August, but earlier submissions are desirable. Late applications will be accepted subject to the availability of openings and funds.

MASTER OF ARTS

A student may be admitted to candidacy when he has successfully completed a minimum of 18 hours of undergraduate course work in economics, or 12 hours of economics and 6 hours of mathematics beyond elementary calculus. An undergraduate grade-point average of 3.0 (on a 4.0 point system) is required, along with acceptable performance on the Graduate Record Examination.

To fulfill requirements for the M.A. degree, a candidate must complete a 30-hour approved program of study with a minimum of 15 hours in courses numbered 400 and above. The program must include Advanced Price Theory and Advanced Income Analysis and one of the following courses or its equivalent (unless such a course has been taken as an undergraduate): Statistics 207, 234, 235, 325, 326; Mathematics 205. The program must include a minimum of 16 hours in economics and may include 6 to 12 hours in mathematics. There is no language requirement.

The student must also complete a satisfactory thesis (for which he may earn as much as 6 semester hours of credit in Economics 490) *or* he must complete a research paper in lieu of a thesis. A student who writes a research paper which substitutes for a thesis will register in Economics 400 for up to 4 hours of credit. Ordinarily he will write his paper in conjunction with a graduate course in which a paper is required (a 300- or 400-level course). Hence, the paper will be a more substantial work than usual and will satisfy both the paper requirement of the regular course, and the M.A. requirement of a paper in lieu of thesis.

The student must pass a written examination which covers four fields: (1) Theory of Production and Price, (2) National

Income Analysis, and (3) two areas of the student's choice from such areas as the following: Comparative Economic Systems and Economic Development; History of Economic Thought; International Economics; Public Finance; Labor Economics; Mathematical Economics; Econometrics; Regional and Urban Economics; Structure of Industry, Monetary Economics, Manpower.

While the examination tests for breadth and depth of understanding and hence covers more than simply the content of courses, it assumes that the student has a thorough knowledge of the material covered in the first 400-level courses taught in the various fields.

As an alternative to the above, the student may elect to take the written and oral Ph.D. comprehensive examinations.

DOCTOR OF PHILOSOPHY

The Ph.D. is awarded to candidates who have attained professional stature in the field of economics. These are people who during at least three years of intensive graduate study have gained a comprehensive knowledge and understanding of theoretical and applied economics.

Ordinarily for admission to the Ph.D. program a student must have in his graduate work to date (consisting of a minimum of 30 hours) a grade-point average of 3.15 (on a 4.00 system). Either before or shortly after beginning course work directed toward a Ph.D., the student takes a qualifying examination. This examination is the final examination for the M.A. degree at UMC or the Ph.D. examination in micro and macro economics. Students entering with a Bachelor's degree must take the qualifying examination by the end of their third semester of full-time study. Students entering with Master's degrees must take the qualifying examination no later than their second semester of full-time study.

The student's program ordinarily includes the following: (1) Micro Economics—451 and 452; (2) Macro Economics—453 and 454; (3) a third area of Economics—6 hours from the following list: Comparative Economic Systems and Economic Development; History of Economic Thought; Economic History; International Economics;

Public Finance; Labor Economics; Mathematical Economics; Econometrics and Activity Analysis; Regional and Urban Economics; Structure of Industry; Manpower Agricultural Economics; Monetary Economics; (4) a fourth area of Economics—6 hours; (5) additional credits in dissertation area, which may be any of the above four areas—6 hours; (6) outside field, such as Mathematics, Statistics, Philosophy, Political Science, Law, History, Psychology, Sociology—12 hours; (7) quantitative work—370 and 472; (8) electives—6 hours; (9) readings—6 hours; and (10) dissertation—12 hours.

The above program totals 72 hours. In addition, a student must complete 18 hours or its equivalent in one language *or* 15 hours or its equivalent in a collateral field such as mathematics, statistics, or sociology.

The student must pass a Comprehensive Examination in the four areas of economics and he must pass a Final Examination concerned primarily with his dissertation. For other regulations, see listings elsewhere in this bulletin.

EDUCATION

BOB G. WOODS, Ph.D., State University of Iowa.
Dean; Prof.

FLOYD G. DELON, Ed.D., University of Arizona.
Director of Graduate Studies; Assoc. Dean;
Prof.

ROBERT L. BURTON, Ed.D., Oklahoma University. Assoc. Dean; Prof.

A. STERL ARTLEY, Ph.D., Pennsylvania State University. Prof.

NEIL C. ASLIN, Ed.D., University of Missouri-Columbia. Prof.

RALPH C. BEDELL, Ph.D., University of Missouri-Columbia. Prof.

DAVID C. BJORKQUIST, Ph.D., University of Minnesota. Prof. of Industrial Education

ROBERT CALLIS, Ph.D., University of Minnesota. Prof.

JAMES L. CRAIGMILE, Ed.D., University of Nebraska. Prof.

ROBERT J. DOLLAR, Ed.D., Oklahoma State University. Prof.

ALLEN J. EDWARDS, Ph.D., State University of Iowa. Prof.

JOHN L. FERGUSON, Ed.D., University of Missouri-Columbia. Prof.

NORMAN C. GYSBERS, Ph.D., University of Michigan. Prof.

VERALEE B. HARDIN, Ed.D., University of Missouri-Columbia. Prof.

JAMES E. HART, Ed.D., University of Missouri-Columbia. Prof.

FRANK HEAGERTY, Ed.D., University of Missouri-Columbia. Prof.

HOWARD W. HEDING, Ph.D., University of Wisconsin. Prof.

EDWIN B. HUTCHINS, Ph.D., University of Illinois. Prof.

LLOYD P. JORGENSEN, Ph.D., University of Wisconsin. Prof.

PAUL T. KING, Ph.D., Pennsylvania State University. Prof.

CHARLES H. KOELLING, Ed.D., University of Missouri-Columbia. Prof.

JOSEPH T. KUNCE, Ph.D., University of Missouri-Columbia. Prof.

GENE M. LOVE, Ph.D., Pennsylvania State University. Prof. of Agricultural Education

JOHN F. MCGOWAN, Ed.D., University of Missouri-Columbia. Prof.

JACK MATTHEWS, Ed.D., University of Missouri-Columbia. Prof.

WILBUR R. MILLER, Ed.D., University of Missouri-Columbia. Prof. of Industrial Education

PAUL C. POLMANTIER, Ph.D., University of Minnesota. Prof.

PAUL C. RITCHIE, Ed.D., University of Missouri-Columbia. Prof. of Physical Education

JOSEPH L. SAUPE, Ed.D., University of Illinois. Prof.

RICHARD G. SCHOFFER, Ed.D., Colorado State College. Prof.

HERBERT W. SCHOOLING, Ed.D., University of Missouri-Columbia. Interim Chancellor; Prof.

MARGARET M. THOMPSON, Ph.D., University of Iowa. Prof. of Physical Education

RICHARD W. THORESON, Ph.D., University of Missouri-Columbia. Prof.

FRANK WELLMAN, Ph.D., University of Nebraska. Prof.

CURTIS R. WESTON, Ed.D., University of Missouri-Columbia. Prof. of Agricultural Education and of Agricultural Engineering

NICHOLAS A. ADAMS, Ed.D., American University, Washington, D.C. Assoc. Prof.

JOHN W. ALSPAUGH, Ed.D., University of Missouri-Columbia. Assoc. Prof.

RICHARD B. CAPLE, Ed.D., Teachers College, Columbia University. Assoc. Prof.

CORRINE S. COPE, Ph.D., Ohio State University. Assoc. Prof.

AUSTIN J. CONNOLLY, Ed.D., Colorado State College. Assoc. Prof.

BEVERLY CRABTREE, Ph.D., Iowa State University. Assoc. Prof. of Home Economics Education

RALPH C. DOBBS, Ed.D., Indiana University. Assoc. Prof. of Extension Education

JOAN DOHERTY, Ed.D., University of Missouri-Columbia. Assoc. Prof.

WAYNE DUMAS, Ed.D., University of Arkansas. Assoc. Prof.

- ARNI T. DUNATHAN, Ed.D., University of Utah.
Assoc. Prof.
- RICHARD A. ENGLISH, Ph.D., University of Arizona. Assoc. Prof.
- CARL C. FEHRLE, Ph.D., University of Iowa.
Assoc. Prof.
- ALICE I. FITZGERALD, Ed.D., University of Missouri-Columbia. Assoc. Prof.
- EDMUND A. FORD, Ed.D., University of Missouri-Columbia. Assoc. Prof.
- GARY C. FOX, Ph.D., Michigan State University.
Assoc. Prof.
- JUDITH K. GROSENICK, Ph.D., University of Kansas. Assoc. Prof.
- PETER HASSELRHIS, Ph.D., Syracuse University.
Assoc. Prof.
- MERLYN HERRICK, Ed.D., Indiana University.
Assoc. Prof. of Education and of Community Health and Medical Practice
- ROBERT C. HYMER, Ed.D., Colorado State College. Assoc. Prof.
- JOSEPH JOHNSTON, Ph.D., University of Michigan. Assoc. Prof.
- HERCULES C. KAZANAS, Ph.D., University of Michigan. Assoc. Prof. of Industrial Education
- R. DEAN KERR, Ed.D., University of Missouri-Columbia. Assoc. Prof.
- DIXIE A. KOHN, Ed.D., University of Missouri-Columbia. Assoc. Prof.
- MARY J. LANG, Ed.D., University of Missouri-Columbia. Assoc. Prof.
- NORMAN S. LAWNICK, Ed.D., University of Missouri-Columbia. Assoc. Prof. of Physical Education
- JOHN B. LEAKE, Ed.D., Oklahoma State University. Assoc. Prof.
- B. CHARLES LEONARD, Ed.D., University of Missouri-Columbia. Assoc. Prof.
- CHRISTOPHER J. LUCAS, Ph.D., Ohio State University. Assoc. Prof.
- EDWARD L. MEYEN, Ph.D., University of Iowa.
Assoc. Prof.
- EARL J. MOORE, Ed.D., University of Nebraska.
Assoc. Prof.
- BEN FRANK NELMS, Ph.D., University of Iowa.
Assoc. Prof.
- DONALD D. OSBURN, Ph.D., North Carolina State. Assoc. Prof.
- JOHN C. REID, Ph.D., University of Missouri-Columbia. Assoc. Prof.
- ROBERT H. REIFSCHNEIDER, Ed.D., University of Nebraska. Assoc. Prof.
- ROBERT F. REYS, Ed.D., University of Missouri-Columbia. Assoc. Prof.
- JOHN A. ROBERTS, Ph.D., University of Iowa.
Assoc. Prof. of Physical Education
- CECIL V. RODERICK, M.Ed., University of Missouri-Columbia. Assoc. Prof. of Agricultural Education
- WARREN R. SEYMOUR, Ph.D., University of Missouri-Columbia. Assoc. Prof.
- CAREY T. SOUTHALL, JR., Ed.D., University of Florida. Assoc. Prof.
- BOB R. STEWART, Ed.D., University of Maryland.
Assoc. Prof. of Agricultural Education
- RALPH E. STEWART, Ed.D., University of Missouri-Columbia. Assoc. Prof. of Physical Education
- TERRY D. TENBRINK, Ph.D., Michigan State University. Assoc. Prof.
- ROBERT R. TRIMBLE, Ph.D., Oklahoma State University. Assoc. Prof.
- JOHN A. VOTH, Ph.D., University of Minnesota.
Assoc. Prof.
- MEREA WILLIAMS, M.A., University of Missouri-Columbia. Assoc. Prof.
- JAMES L. BALLINGER, Ed.D., University of Missouri-Columbia. Asst. Prof.
- JANE G. BENNETT, M.S., University of Wisconsin. Asst. Prof.
- COLIN E. BOX, Ph.D., Indiana University. Asst. Prof.
- WILLIAM J. BUNGE, M.Ed., University of Missouri-Columbia. Asst. Prof.
- WILLIAM M. BUSCH, M.S., Southern Illinois University. Asst. Prof.
- IRVIN W. COCKRIEL, Ed.D., University of Missouri-Columbia. Asst. Prof.
- DABNEY B. DOTY, M.Ed., University of Missouri-Columbia. Asst. Prof.
- JOHN E. ELIAS, Ed.D., University of Nebraska.
Asst. Prof.
- DAVID A. GARLOFF, Ed.D., Indiana University.
Asst. Prof.
- FREDERICK J. GIES, Ed.D., University of Missouri-Columbia. Asst. Prof.
- ROBERT HARTH, Ed.D., George Peabody College for Teachers. Asst. Prof.
- ROGER DUANE HARTING, Ed.D., University of Missouri-Columbia. Asst. Prof.
- DOROTHY HOLSINGER, M.Ed., University of Missouri-Columbia. Asst. Prof. of Physical Education
- MARILEE HOWELL, M.Ed., University of Missouri-Columbia. Asst. Prof. of Physical Education
- JAMES B. KARNES, Ed.D., University of Missouri-Columbia. Asst. Prof. of Industrial Education
- FRANKLIN J. KING, Ed.D., University of Missouri-Columbia. Asst. Prof.
- LINNEA D. LIJJA, Ph.D., University of Minnesota. Asst. Prof.
- MARILYN MARKEL, Ed.D., University of Missouri-Columbia. Asst. Prof.
- MARY M. MEREDITH, M.S., University of Missouri-Columbia. Asst. Prof.
- MARVELLEE MICHEL, Ed.D., University of Missouri-Columbia. Asst. Prof. of Physical Education
- MARY V. MORGAN, M.Ed., University of Missouri-Columbia. Asst. Prof.
- EDWARD J. O'BRIEN, M.Ed., University of Missouri-Columbia. Asst. Prof.
- CAROL A. ODOR, M.S., University of Tennessee.
Asst. Prof.

NELIA T. PETTIT, Ed.D., University of Missouri-Columbia. Asst. Prof.
 JOAN QUILLING, Ph.D., Michigan State University. Asst. Prof.
 MARY M. ROBERTS, Ed.D., University of Missouri-Columbia. Asst. Prof.
 HARRY E. SMITH, M.Ed., University of Missouri-Columbia. Asst. Prof.
 JEAN Y. SMITH, M.Ed., University of Missouri-Columbia. Asst. Prof.
 NORMAN E. STEWART, M.Ed., University of Missouri-Columbia. Asst. Prof. of Physical Education
 JAMES N. THOMPSON, Ed.D., University of Missouri-Columbia. Asst. Prof.
 VERNON L. WHITNEY, M.Ed., University of Missouri-Columbia. Asst. Prof.
 CARL G. WILLIS, Ed.D., Oklahoma State University. Asst. Prof.
 MARILYN J. ZURMUEHLEN, Ph.D., Pennsylvania State University. Asst. Prof.

DEGREE PROGRAMS

Graduate work in education is organized to lead to the following graduate degrees: Master of Education and Doctor of Education; Master of Arts and Doctor of Philosophy. The Graduate Certificate of Specialization in Education with Designation is offered to students who have completed an approved two-year program of graduate work. The various programs (departmentalized at the undergraduate level) are coordinated into one Graduate Department of Education and offer degree work in the following areas.

COUNSELING AND PERSONNEL SERVICES

MASTER OF ARTS OR MASTER OF EDUCATION

Program I Elementary School Counseling
 Program II Secondary School Counseling
 Program III College Student Personnel Services
 Program IV Employment Service Counseling
 Program V Rehabilitation Counseling

CERTIFICATE OF SPECIALIZATION

Program I Guidance & Counseling
 Program II College Student Personnel Services
 Program III Employment Service Counseling
 Program IV Rehabilitation Counseling

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

Program I Counseling Psychology
 Program II College Student Personnel Services

CURRICULUM AND INSTRUCTION

MASTER OF ARTS OR MASTER OF EDUCATION

Program I Elementary Education
 Program II Reading: Elementary
 Program III Secondary Education
 Program IV Reading: Secondary
 Program V Instructional Media

Program VI Music Education
 Program VII Art Education
 Program VIII Science Education
 Program IX Mathematics Education
 Program X English Education
 Program XI Social Studies Education

CERTIFICATE OF SPECIALIZATION

Program I Elementary Education
 Program II Secondary Education
 Program III Curriculum and Instruction

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

Program I Elementary Education
 Program II Secondary Education
 Program III Science Education
 Program IV Mathematics Education
 Program V English Education
 Program VI Social Studies Education

EDUCATIONAL ADMINISTRATION

MASTER OF ARTS OR MASTER OF EDUCATION

Program I Elementary School Administration and Supervision
 Program II Secondary School Administration and Supervision
 Program III General School Administration and Supervision

CERTIFICATE OF SPECIALIZATION

Program I Elementary School Administration and Supervision
 Program II Secondary School Administration and Supervision
 Program III General School Administration and Supervision

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

Program I Elementary School Administration and Supervision
 Program II Secondary School Administration and Supervision
 Program III General School Administration and Supervision

EDUCATIONAL PSYCHOLOGY

MASTER OF ARTS OR MASTER OF EDUCATION

Program I Educational Psychology

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

Program I Educational Psychology

HEALTH AND PHYSICAL EDUCATION

MASTER OF ARTS OR MASTER OF EDUCATION

Program I Secondary School Physical Education
 Program II Elementary School Physical Education
 Program III Adapted/Special Physical Education

CERTIFICATE OF SPECIALIZATION

Program I Elementary/Secondary School Physical Education Supervision

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

Program I College Physical Education
 Program II Physical Education Administration/Supervision
 Program III Human Performance/Motor Development and Learning

HIGHER AND ADULT EDUCATION

MASTER OF ARTS OR MASTER OF EDUCATION

- Program I Adult Education Teaching
- Program II Adult Education Administration
- Program III Higher Education
- Program IV Junior College Education

CERTIFICATE OF SPECIALIZATION

- Program I Adult Education
- Program II Junior College Teaching
- Program III Higher Education

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

- Program I Higher Education

PRACTICAL ARTS AND VOCATIONAL-TECHNICAL EDUCATION

MASTER OF EDUCATION

- Program I Home Economics Education
- Program II Agricultural Education
- Program III Industrial Arts Education
- Program IV Business and Office Education
- Program V Distributive Education
- Program VI Trade and Technical Education
- Program VII Supervision and Administration of Occupational Education

CERTIFICATE OF SPECIALIZATION

- Program I Home Economics Education
- Program II Agricultural Education
- Program III Industrial Arts Education
- Program IV Business and Office Education
- Program V Distributive Education
- Program VI Trade and Technical Education
- Program VII Supervision and Administration of Occupational Education

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

- Program I Home Economics Education
- Program II Agricultural Education
- Program III Business Education
- Program IV Industrial and Technical Education
- Program V Distributive Education
- Program VI Research in Occupational Education

SPECIAL EDUCATION

MASTER OF ARTS OR MASTER OF EDUCATION

- Program I Mental Retardation
- Program II Emotionally Disturbed
- Program III Orthopedically Handicapped
- Program IV Learning Disabilities

CERTIFICATE OF SPECIALIZATION

- Program I Mental Retardation
- Program II Administration and Supervision of Special Education

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

- Program I Mental Retardation
- Program II Administration and Supervision of Special Education

EDUCATIONAL FOUNDATIONS

MASTER OF ARTS OR MASTER OF EDUCATION

- Program I History of Education
- Program II Philosophy of Education

DOCTOR OF EDUCATION OR DOCTOR OF PHILOSOPHY

- Program I History of Education
- Program II Philosophy of Education

ENTRANCE REQUIREMENTS

All graduate students in Education are required to take a Graduate Battery Examination for advisement purposes. The examination should be taken prior to the initial registration. If this is not possible, it must be taken during the first session of enrollment. To be accepted for advisement for the degree of Master of Education or Master of Arts, students must have been regularly admitted to the Graduate School and must have completed a minimum of fifteen semester hours in courses in education in an accredited institution. It is advised that these courses should have been selected to fulfill the requirements for a certificate to teach in the public schools. An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on the basis of this record alone.

Prospective graduate students who wish to be admitted to the Graduate School in order to work in a graduate program in education should make application to the Office of Admissions, 130 Jesse Hall, University of Missouri-Columbia, Columbia, Missouri 65201, at least sixty days prior to the initial enrollment. The student who fails to make application prior to this deadline may be admitted as a non-degree student pending determination of qualifications.

To be accepted for advisement for the Master of Education or the Master of Arts in Education, the student must have an adviser in his area of specialization. He must also have acceptable scores on the Graduate Battery examinations. A student with an undergraduate GPA of between 2.2 and 3.0 will be considered for advisement if other background information or circumstances indicate the likelihood of success in the graduate program. For students with a GPA of between 2.2 and 2.5 the adviser may request a review of the student's credentials, including the graduate battery examinations, by a committee of three, appointed by the Dean of the College of Education. The ultimate decision regarding admission to candidacy shall be by vote of the committee.

REQUIREMENTS FOR THE M.Ed. DEGREE

Residence: The equivalent of two semesters of 16 weeks, each devoted to advanced courses of study, is required for the degree of Master of Education. This requirement may be met in part by correspondence or extension work offered by the University of Missouri. A maximum total of eight hours of such work taken may be credited toward the degree, provided such work has prior approval of a student's adviser and the Dean of the Graduate School. Because of the desirability of a student establishing himself as a master's candidate, graduate work will not be counted toward the Master of Education degree from more than two campuses of the University. In other words, it is not possible to count credit earned toward a Master's degree from more than two cooperative centers, or one cooperative center and from UMC. In order to provide an opportunity for a closer and less interrupted relationship between candidates and their advisers than is possible in summer sessions, it is strongly recommended that candidates for the Master's degree spend at least one full semester in residence.

Program of study: Over and above the prerequisites, a program of study must include a minimum of 32 semester hours of approved graduate credit. A minimum of one-half of the program, 16 hours, must consist of courses numbered 400 or above. At least 80 per cent of the total program for the degree must be passed with a grade of *A* or *B*, and at least 75 per cent of a student's entire graduate record must be passed with a grade of *A* or *B*. The program must include not less than 16 hours of graduate courses in education. The program may consist entirely of courses in education, or may be made up in part, of courses from other departments selected to fit the professional needs of the candidate.

A thesis is not required, but the major adviser may require written reports of field work or special investigation.

A final examination, written in form and comprehensive in character, is required. The examination is approximately four hours in length and is conducted under the direction of the major adviser. The examination encompasses the major areas of

emphasis on the student's program of study. If a student is not enrolled for course work during the semester in which the comprehensive examination is taken, he will enroll for "examination only" before taking this examination.

REQUIREMENTS FOR THE M.A. DEGREE IN EDUCATION

Many of the regulations governing the degree of Master of Arts in Education are similar to those governing the degree of Master of Education, but there are several differences. The degree of Master of Arts is planned to emphasize research. Students should read carefully the regulations governing the degree of Master of Arts.

Prerequisites and admission requirements are the same as for the Master of Education. The choice of adviser is the same except that for the M.A., the candidate may have a major and a minor field with advisers in both. The procedure for filing an application for the degree is the same as in the residence requirement.

The program of study for the Master of Arts in Education may include major and minor fields and must include a course in Statistics and one in Methods of Research. The program will emphasize courses dealing with research.

A thesis is required. See the general statement of requirements for a thesis for the Master's degree.

A final examination is required and also follows the requisites for the M.A. degree as given elsewhere in this bulletin.

REQUIREMENTS FOR THE CERTIFICATE OF SPECIALIZATION IN EDUCATION WITH DESIGNATION

The Graduate Certificate of Specialization in Education represents a program of organized and approved graduate work consisting of a minimum of 30 semester hours beyond the requirements for the Master's degree. It is anticipated that the program for the Certificate will be in the same area of Education in which the Master's degree was taken. The Certificate program will be one of specialization and will be built on the foundation represented by

the Master's degree or comparable training.

A candidate for the Certificate will complete an application to be approved by the adviser, the Dean of the College of Education, and the Dean of the Graduate School. The program for the Certificate will be directed by an advisory committee appointed by the Dean of the Graduate School with the major adviser acting as chairman of the committee.

The required 30-hour program for the Certificate of Specialization, beyond the requirements for the Master's degree, must be completed within a period of eight years. The work for the Certificate may be taken in summer sessions.

A candidate for the Certificate will be required to take a qualifying comprehensive examination as determined by the advisory committee. If the student has received the Master's degree from the University of Missouri within five years prior to the date of his application for the Certificate, the advisory committee will have the authority to waive the qualifying examination.

A final examination, either oral or written or both, will be required by the advisory committee.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF EDUCATION

The degree of Doctor of Education is offered to students who have pursued advanced courses of study without serious interruption for a period of at least six semesters. Candidates for the degree of Doctor of Education must have attained the degree of Master of Arts with a major in Education or the degree of Master of Education, or the quantitative and qualitative equivalent of one of these degrees from a college or university of recognized standing. See Table of Contents for page numbers of the general regulations for this degree.

The program of study is determined by the major adviser in cooperation with a consulting committee appointed by the Dean of the Graduate School. The Program shall constitute a well-organized plan of professional specialization in one of the major fields of education. A minimum of

82 semester hours of work above the Bachelor's degree is required for the degree of Doctor of Education. Continuity of effort must be obtained by at least two semesters beyond the Master's degree in which the registration has been 12 hours or more. During these semesters a student may not be employed for more than half-time teaching. With the approval of the major adviser and the Dean of the Graduate School, a maximum of two years of graduate work completed in other institutions with recognized graduate schools may be accepted toward the requirements. In any event, the candidate must be enrolled in residence on the UMC campus for a minimum of one year.

Non-resident research: When the facilities or materials necessitate that work be done away from the UMC campus, a student, upon the recommendation of his adviser and the approval of the Graduate School, may regularly enroll for off-campus research. To enroll for non-resident research, a student must have already completed 32 semester hours of acceptable graduate work. Candidates for the Doctor of Education may not register for more than three semester hours of non-resident work during a given semester; the total amount of non-resident research counted toward the degree of Doctor of Education is limited to six semester hours. The results of non-resident research should be included in a dissertation presented to the Graduate Faculty in partial fulfillment of the requirements for an advanced degree.

Apprentice training: A candidate majoring in some aspect of educational administration and supervision or in a special field of teaching who has not had acceptable experience in the field may be required (as part of his program of studies) to work one semester as an apprentice. This apprentice work would be conducted in a school system approved by the faculty of the College of Education. The supervision of apprentice work is handled by the candidate's major adviser; not more than 12 hours' credit (the equivalent of one semester) may be granted for such work. Only students who have completed a minimum of 12 hours beyond the A.M. or M.Ed. degree (or the equivalent) are eligible for apprentice training.

A matriculation examination must be taken no earlier than the second year of graduate work and no later than October 15 preceding the May in which the candidate plans to complete the requirements for the degree, or preceding December 15 if the requirements are to be completed in August. This examination will be given only to students who have completed the requirement in statistics and research methodology mentioned below. The examination is comprehensive and includes the candidate's major fields of interest; it is conducted by the major adviser and consulting committee. If the results of the examination are such as to give evidence that the candidate can pursue further graduate study profitably, he will be advised to do so. Before being admitted to the matriculation examination, the candidate is required to give satisfactory evidence of sufficient knowledge of statistics and educational research techniques as to enable him to understand and utilize research reports in the field of education. To satisfy this requirement, the student shall have earned credit in courses in Elementary Educational Statistics, Advanced Educational Statistics, and Methods of Educational Research. Acquaintance with foreign languages will not be required except as may be determined by the candidate's major adviser.

A dissertation is required for which not less than 8 hours of credit may be granted. There is no maximum credit restriction for the dissertation provided that more than 70 graduate hours of other approved courses are completed and granted toward the Doctor of Education degree. The dissertation must be reviewed and approved by the candidate's consulting committee.

A final oral examination on the work included in the dissertation is also required. This examination is conducted by the major adviser and the consulting committee.

REQUIREMENTS FOR THE Ph.D. IN EDUCATION

The program for the degree of Doctor of Philosophy with a major in Education is based on work for the degree of Master of Arts with a major in Education or the equivalent.

The degree of Doctor of Philosophy with a major in Education is a research degree;

the dissertation (offered in partial fulfillment of the requirements) must give evidence of satisfactory control of the technical instruments and research procedures in the field of education. Candidates for the Ph.D. in Education must demonstrate competence in a research foundations area by earning credit with grades of *B* or better in the following courses (or their equivalents): Educational Statistics, Advanced Educational Statistics, Computer Application of Educational Research, and Methods of Educational Research. Exceptions to one or more of the research foundation courses (for specific applications) must be approved by the College of Education Policy Committee.

Languages and/or language substitutes are not required for the Ph.D. in Education. When these items are not elected, the College of Education requires a research support area; competence must be demonstrated in a designated area of study in departments or academic areas of UMC, other than Education, by: (1) offering a minimum of 12 hours of credit with a grade point average of 3.0 or better in courses approved by the student's advisory committee, or (2) examination by the department offering the support area. The research support area shall be formulated as complementary to research in the major area of specialization. The research support area shall (1) provide a command of a specialized research technique, or (2) be relevant to theoretical concepts that will provide added depth and structure to research in the area of specialization.

SUGGESTED COURSES FOR COLLEGE TEACHERS OR ADMINISTRATORS

Advanced graduate students who expect to teach or to hold administrative positions in colleges (including junior colleges) and who desire professional Education courses as part of their preparation are advised to consider the following:

- Education K400—Problems in Higher Education
- Education K410—Seminar in Higher Education
- Education K465—The Junior College
- Education K468—College Teaching
- Education K475—College Administration
- Education K480—Internship in Administration in
Higher Education
- Education K490—Research in Higher Education

Attention is called to the following courses in other areas of Education:

Education B473—The Development of Higher Education in the United States

Education C441—Problems in School Finance

Education C451—School Staff Personnel Administration

Education C453—Advanced School Building Problems

Education F406—Problems in Adult Education

ELECTRICAL ENGINEERING

CYRUS O. HARBOUR, Ph.D., Syracuse University.
Chairman; Prof.

GAYLE E. ADAMS, Ph.D., University of Wisconsin. Director, Computer Engineering and Development Center; Prof.

CARMELO CALABRESE, Ph.D., University of Missouri-Columbia. Coordinator, Engineering Extension Programs in Kansas City Area; Prof.

ROBERT L. CARTER, Ph.D., Duke University.
Prof.

SAMUEL J. DWYER, III, Ph.D., University of Texas. Director, Bioengineering; Prof.

PAUL W. FRANKLIN, Ph.D., Technical University of Vienna. Prof.

RICHARD G. HOFT, Ph.D., Iowa State University. Prof.

GLADWYN V. LAGO, Ph.D., Purdue University.
Director of Graduate Studies; Prof.

JOHN F. LAMB, Sc.D., University of Michigan.
Prof. Emeritus

FRED W. LEONHARD, Ph.D., University of Tubingen. Prof.

JAMES R. TUDOR, Ph.D., Illinois Institute of Technology. Missouri Electric Utilities Professorship of Power Systems Engineering; Prof.

DONALD L. WAIDELICH, Ph.D., Iowa State University. Prof.

CLIFFORD M. WALLIS, Sc. D., Harvard University.
Prof. Emeritus

EARL J. CHARLSON, Ph.D., Carnegie Institute of Technology. Assoc. Prof.

DAVID H.S. CHENG, Ph.D., University of Missouri-Columbia. Assoc. Prof.

ROBERT G. COMBS, Ph.D., University of Florida.
Assoc. Prof.

CHARLES A. HARLOW, Ph.D., University of Texas.
Assoc. Prof.

ALY A.A. MAHMOUD, Ph.D., Purdue University.
Assoc. Prof.

ROBERT W. MCLAREN, Ph.D., Purdue University. Assoc. Prof.

GRANVILLE E. OTT, Ph.D., University of Texas.
Assoc. Prof.

C. LEON PARTAIN, Ph.D., Purdue University.
Assoc. Prof.

JAMES E. RATHKE, Ph.D., University of Kansas.
Assoc. Prof.

BYRON W. SHERMAN, Ph.D., University of Missouri-Columbia. Assoc. Prof.

ARTHUR J. CARLSON, Ph.D., University of Iowa.
Asst. Prof.

MICHAEL J. DEVANEY, Ph.D., University of Missouri-Columbia. Asst. Prof.

ERNEST L. HALL, Ph.D., University of Missouri-Columbia. Asst. Prof.

JOHN J. KOMO, Ph.D., University of Missouri-Rolla. Asst. Prof.

HARRY PEARLE, Ph.D., Northwestern University.
Asst. Prof.

CHARLES R. SLIVINSKY, Ph.D., University of Arizona. Asst. Prof.

DENNIS L. TEBBE, Ph.D., University of Missouri-Columbia. Asst. Prof.

EDWARD J. VREDENBURGH, M.S., University of Missouri-Columbia. Asst. Prof.

REX A. WAID, Ph.D., University of Wisconsin. Undergraduate Program Director; Asst. Prof.

LEWIS N. WALKER, Ph.D., University of Missouri-Columbia. Asst. Prof.

The Electrical Engineering Department offers degree programs leading to a Master of Science and to the Ph.D.

Graduate study in Electrical Engineering is designed to prepare students for research and advanced design work in industry and for university research and teaching. To accomplish this, the graduate course offerings in the department provide opportunities for theoretical study and for experimental work in several major areas of Electrical Engineering. Areas of study include network theory, information systems, power systems, bioengineering, energy conversion, computer systems, field theory, solid state, and control systems.

To supplement classroom work, laboratories are well equipped with modern test and measuring equipment necessary for advanced design and research. The computing facilities in engineering include Electronic Associate's TR-48 and TR-10 analog computers, an IBM 360 50 digital computer, and Systems Engineering Laboratories 840-A digital computer and data acquisition system. To provide fast turnaround, the 360/50 has a separate card-reader and line-printer, which provide "open-shop" operation for short jobs. Longer jobs are done via "closed-shop." The 840-A computer is used primarily for research and development work. Library facilities in Electrical Engineering are provided by the Engineering Library in the Engineering building and by the University of Missouri-Columbia Library located about three blocks from the Electrical Engineering building.

Fellowships, scholarships, and teaching and research assistantships are available to qualified students. Applications should be submitted by March 1, each year. Additional information including applications for financial support can be obtained from the Director, Electrical Engineering Graduate Program, Electrical Engineering Department.

MASTER OF SCIENCE DEGREE

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. However, acceptance for advisement in Electrical Engineering is based on a 2.75 or higher GPA in all undergraduate work ($A=4$). Preferably, the student should have a B.S. in Electrical Engineering or other science-based curriculum. Consideration is given to grade trends, performance in the student's major area, class rank, experience, and other criteria bearing on his probable success in graduate study. A student should also have taken the verbal, quantitative and advanced engineering sections of the GRE.

To fulfill the requirements for the M.S. degree, a candidate must complete 30 hours, including at least 15 hours of 400-level courses. It is recommended that all students take 3 hours of Electrical Engineering 400, Problems, as part of the 30 hours; no more than six will be accepted for credit. A grade average of *B* or better is required by the Department in all course work.

A student should also refer to the regulations governing Master's degrees given elsewhere in this bulletin.

THE DOCTOR OF PHILOSOPHY DEGREE

Before applying for admission to candidacy, a student must be admitted to the Graduate School and be accepted for advisement in Electrical Engineering. To be accepted for advisement, a student should show superior performance on the verbal, quantitative, and advanced engineering parts of the GRE and have a 3.0 or higher GPA in all previous graduate course work ($A=4$). Consideration is given to grade trends, experience, maturity, and other

criteria bearing on the student's probable success in the program.

To be accepted as a candidate for the Ph.D., the student must complete the equivalent of an M.S. in Electrical Engineering and demonstrate competency by a written and/or oral qualifying examination conducted by an Advisory Committee.

To fulfill requirements for the Ph.D. degree, a candidate must complete his program of study as approved by his advisory committee. The committee sets the total hours; generally about 60 hours of courses beyond the B.S. are required. Research credit provides an additional 18 credits.

He must pass a written comprehensive examination in Electrical Engineering and at least one supporting area. He must complete his doctoral dissertation on a topic approved by his committee and defend it in an oral, final examination.

The student should refer also to the regulations governing doctoral degrees as given elsewhere in this bulletin.

ENGLISH

MILTON MCC. GATCH, Ph.D., Yale University.
Chairman; Assoc. Prof.

JOHN R. ROBERTS, Ph.D., University of Illinois.
Assoc. Chairman; Director of Graduate Studies;
Assoc. Prof.

J. DONALD CROWLEY, Ph.D., Ohio State University. Assoc. Chairman; Director of Undergraduate Studies; Assoc. Prof.

DONALD K. ANDERSON, Ph.D., Duke University.
Assoc. Dean of the Graduate School; Prof.

LEON T. DICKINSON, Ph.D., University of Chicago. Prof.

DONALD F. DRUMMOND, Ed.D., Stanford University. Prof.

CHARLES M. HUDSON, Ph.D., Yale University.
Prof.

WILLOUGHBY H. JOHNSON, M.A., Vanderbilt University. Prof.

WILLIAM M. JONES, Ph.D., Northwestern University. Prof.

RICHARD J. LOFTUS, Ph.D., University of Wisconsin. Prof.

JAMES T. MCAFEE, M.A., University of Missouri-Columbia. Prof.

GEORGE B. PACE, Ph.D., University of Virginia.
Prof.

WILLIAM H. PEDEN, Ph.D., University of Virginia. Prof.

EDWARD H. WEATHERLY, Ph.D., Yale University. Prof.

ROBERT M. BENDER, Ph.D., University of Michigan. Assoc. Prof.

HOWARD W. FULWEILER, Ph.D., University of North Carolina. Prof.
 RICHARD A. HOCKS, Ph.D., University of North Carolina. Assoc. Prof.
 JAMES V. HOLLERAN, Ph.D., Louisiana State University. Assoc. Prof.
 BEN F. NELMS, Ph.D., University of Iowa. Assoc. Prof.
 WILLIAM V. HOLTZ, Ph.D., University of Michigan. Assoc. Prof.
 THOMAS D. COOKE, Ph.D., University of Pittsburgh. Asst. Prof.
 ALBERT J. DEVLIN, Ph.D., University of Kansas. Asst. Prof.
 MICHAEL E. GREENE, Ph.D., Indiana University. Asst. Prof.
 JAMES M. HELDMAN, Ph.D., University of North Carolina. Asst. Prof.
 HOWARD H. HINKEL, Ph.D., Tulane University. Asst. Prof.
 DONALD M. LANCE, Ph.D., University of Texas. Asst. Prof.
 STANLEY J. ROSKOSKI, Ph.D., Indiana University. Asst. Prof.
 HERBERT L. STAPPENBECK, Ph.D., University of Texas. Asst. Prof.
 DONALD I. YEATS, Ph.D., University of Kansas. Asst. Prof.

The Department of English offers graduate work leading to the Master of Arts and Doctor of Philosophy degrees. The areas of concentration offered by the department include linguistics, medieval literature, the renaissance, the 17th and 18th centuries, the 19th century, American literature, and criticism and the 20th century.

Graduate, teaching, dissertation, NDEA and EPDA fellowships, teaching assistantships, and other means of financial aid are available. March 1 is the deadline for applications for the school year beginning in August. Transcripts, GRE results, and three letters of recommendation must accompany the application. Write the Director of Graduate Studies, Department of English, for forms.

All candidates are expected to make satisfactory progress toward the completion of their degrees. Normally, the Master's degree is completed in one calendar year and the Ph.D., within four or five years of full-time study beyond the Baccalaureate degree. (This does not imply that a candidate must be enrolled full-time during the entire duration of his doctoral work.)

If a student indicates, either by low grades or a pattern of incomplete and delayed work, that he is not a serious can-

didate for a degree, his candidacy will not be continued. The lowest passing grade for graduate work is *B*. Consistent *B* or near-*B* work will not be interpreted as satisfactory evidence of Ph.D. ability, and the student with such a record will not be encouraged to pursue work beyond the M.A. level. No grade of *C* will be counted for credit toward either the M.A. or the Ph.D. degree. If a candidate for either degree receives three grades of *C* or *F*, from at least two different instructors, the Department will not continue his candidacy.

THE M.A. DEGREE

An M.A. candidate should have a Baccalaureate degree in English with a distribution of courses comparable to that required at the University of Missouri-Columbia, (i.e., a minimum of 32 hours, including at least 18 hours in the fields of Advanced Writing, Linguistics and Medieval Literature, The Renaissance, The 17th and 18th Centuries, The 19th Century, The 20th Century, and American Literature; and at least 8 hours in such related fields as Classics, European History, Philosophy, Art History, and so on.) A student should possess an undergraduate GPA of at least *B* (3.0 on a 4.0 scale), and his record in English should be higher than this minimum. If a student's undergraduate major was not in English, or not comparable to that offered by UMC, he may be required, as a condition of acceptance, to take more than the normal course load for the M.A., as determined by the Committee of Admissions.

The M.A. candidate is required to take 30 or more hours of course work, of which at least 15 hours must be in courses numbered 401 or higher. The student must take at least one course from each of the following fields: (1) Linguistics and Medieval Literature [319, The Structure of American English, or a comparable course, is required unless already completed]; (2) The Renaissance; (3) The Seventeenth and Eighteenth Centuries; (4) The Nineteenth Century; (5) American Literature; and (6) Criticism and The Twentieth Century. He may include in his program not more than 6 hours in writing courses or courses outside the Department which re-

late to English literature. All course work toward the M.A. degree should be taken in residence at UMC.

In special cases the student may write a thesis on a topic approved by his adviser and by the Department. The thesis will count as 6 hours of the student's M.A. program.

After completion of at least 24 hours of work for the M.A., the student must pass a written final examination composed of two parts: (1) a 1½-hour essay on one of the six literary periods listed above; he will choose one question from three provided for him at the time of the examination; and (2) a 1½-hour critical essay on an unannounced work—such as a lyric poem—which is provided for the student at the time of the examination. A student who fails to pass both parts of the examination will be required to repeat only that part which he failed; he will not be allowed to take either or both parts of the examination more than twice. The final examination is usually given in January, May, and July of each year. Any student wishing to take the examination must give written notice to the Director of Graduate Studies at least one month prior to the desired date.

THE Ph.D. DEGREE

A candidate for the Ph.D. in English must hold an M.A. degree in English or have completed at least 30 hours of graduate work in the field. Before registering for courses, he must confer with the Director of Graduate Studies who will act as his adviser until he is assigned a temporary adviser.

To be accepted as a candidate, the student must be certified for candidacy by an Advisory Committee appointed by the Director of Graduate Studies, and he must secure the Committee's approval of his projected course of study. He will be required to meet with his Advisory Committee for a Qualifying Examination during his first semester of Ph.D. course work. The examination will consist of (1) a 50-minute essay on a work or topic chosen by the student in consultation with his adviser, and (2) an oral examination by the Advisory Committee. Any student who does not pass the Qualifying Examina-

tion may be allowed, at the discretion of the committee, to meet again with his committee after a period of approximately three months for a re-evaluation. No student may have his qualifications for candidacy evaluated more than twice. This procedure applies to all students admitted to candidacy for the Ph.D. after September, 1970.

To satisfy the requirements for the Ph.D. degree, the candidate must fulfill the regulations set by the Graduate School—listed elsewhere in this bulletin—as well as the departmental requirements.

The Ph.D. candidate must take approximately 64 hours of graduate work, at least half of them at the 400 level. (Credit granted for English 490 is excluded from this total; and a maximum of 3 hours can be granted for English 400 only after written permission is obtained from the Graduate Studies Committee.) A minimum of 24 hours of course work (excluding research hours) beyond the M.A. must be taken in residence at the Columbia Campus. These 24 hours must be in English and are usually the last 24 hours taken. The candidate must take at least one course of graduate work in each of the six fields listed below. In addition, he must have had or will be required to take (1) a course in the structure of the English language [319, 417, or an equivalent course elsewhere], (2) a course in the historical aspects of the English language [320, 418, or an equivalent course elsewhere], and (3) a course in bibliography and methods of research [401 or its equivalent elsewhere]. A candidate must also take at least one, but not more than two, of the doctoral seminars numbered 499 A-I, and 9 hours of course work outside the Department in a field or fields related to his program of study.

A student may satisfy the foreign language requirement in either of two ways: (1) He may demonstrate his knowledge of one foreign language and its literature at the fourth-year college level. If he chooses this option, the student must satisfy the requirement during his graduate study by passing with a grade of *B*, two upperclass literature courses in the language chosen, or by passing a high-level proficiency test agreed upon by the language department concerned and the En-

glish Department. (If a student fulfills this requirement with two upperclass courses in a foreign language, he may not count these courses toward fulfilling requirements in an outside area of his degree program.) French, German, or Latin will automatically be accepted as fulfilling this requirement; another language may be substituted with the consent of the student's Advisory Committee. (2) A student may satisfy the foreign language requirement by passing ETS examinations in two foreign languages (French, German, or others approved by the Advisory Committee). All language requirements must be satisfactorily completed before the candidate is eligible to take the Comprehensive Examinations. A student is urged to fulfill this requirement early in his program.

At least seven months before taking the Final Oral Examination, the candidate must pass a Comprehensive Examination. This examination will consist of three parts: The first two parts will be two four-hour written examinations in two of the six fields of English and American literature: (1) Linguistics or Medieval literature or both, (2) The Renaissance, (3) The Seventeenth and Eighteenth Centuries, (4) The Nineteenth Century, (5) American Literature, and (6) Criticism and The Twentieth Century. One of these fields will be designated by the student as his major field (normally the field in which he will write his dissertation) and the other as his minor field. Upon satisfactory completion of the written sections, the student will be given an oral examination of approximately two hours duration by his Examining Committee.

The dissertation and the final oral examination on the dissertation and its field complete the requirements for the Ph.D. in English.



ENTOMOLOGY

- MAHLON L. FAIRCHILD, Ph.D., Iowa State. Chairman; Director of Graduate Studies; Prof.
 HARRY E. BROWN, A.M., University of Missouri-Columbia. Prof.
 WILBUR R. ENNS, Ph.D., University of Kansas. Prof.
 CURTIS W. WINGO, Ph.D., Iowa State. Prof.
 ARMON J. KEASTER, Ph.D., University of Missouri-Columbia. Assoc. Prof.
 CHARLES O. KNOWLES, Ph.D., University of Wisconsin. Assoc. Prof.
 G. MICHAEL CHIPPENDALE, Ph.D., University of Wisconsin. Asst. Prof.
 KEITH HARRENDORF, M.S., University of Arkansas. Asst. Prof.
 JIMMY H. HATCHETT, Ph.D., Purdue University. Asst. Prof.
 WILLIAM H. KEARBY, Ph.D., University of Wisconsin. Asst. Prof.
 THOMAS R. YONKE, Ph.D., University of Wisconsin. Asst. Prof.

The Department of Entomology offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees. A student can select his training from a wide range of courses and research programs to fit his needs for a career in any of the many areas of professional entomology, including research, teaching, industry, and extension work. Current research programs in the department emphasize the following areas: biological and chemical control, ecology, forest entomology, host-plant relations, insecticidal residues, medical and veterinary entomology, morphology, nutrition, physiology and biochemistry, systematics, and toxicology.

The Entomology Department is housed in the Agriculture Building, recognized as one of the most modern on campus, which also conveniently houses several allied departments, including Food Science and Nutrition, Horticulture, Plant Pathology, and the School of Forestry. The Entomology Department itself includes eight major research laboratories totalling 7,000 square feet, as well as preparation rooms, classrooms, and teaching laboratory facilities. The research laboratories are equipped with a wide range of instruments and environmental growth chambers for advanced study. The building also offers the Department access to the Experiment Station electron microscope, chemical, and spectro-

scopic laboratories. The entomology research museum, which occupies 2,000 square feet, provides many opportunities for research in systematic entomology. The collection of about 750,000 specimens includes insects, spiders, and mites and is the largest in the State.

Excellent library facilities nearby on campus include the main library, with over one million volumes, and up-to-date medical and veterinary branch libraries. The computing center and nuclear reactor also offer facilities for more specialized research.

Field research scientists are well-served by a bank of new greenhouses on campus and the forty-acre entomology farm located near Columbia. Eight other Experiment Station farms, such as the Delta Research Center at Portageville, provide many opportunities for studying the various insect problems which exist throughout the State. For those interested in ecology, the State offers a large acreage of natural wildlife reserves, including Tucker Prairie and Ashland Arboretum, both within twenty-five miles of Columbia.

The Department also conducts cooperative research projects with the USDA Biological Control of Insects Research Laboratory and the USDI Fish Pesticide Research Laboratory, both located in Columbia.

Research assistantships are currently available to aid qualified students in their graduate studies in Entomology. The annual stipend is \$3,350 for students with the B.S. degree and \$3,950 for students with the M.S. degree. In addition, two \$100 awards are given annually. For further information write to the Chairman or a specific staff member, Department of Entomology, 1-87 Agriculture Building.

M.S. DEGREE

A screening committee determines admission to the Department. The applicant must submit official transcripts from all colleges attended, two letters of recommendation from professors, and a letter of intent. The candidate's degree program is arranged in committee with his adviser and two other entomology department faculty members in attendance. To fulfill the degree requirements a candidate must (1)

meet all Graduate School requirements, (2) prepare a thesis, though some exceptions are made, and (3) complete a final oral examination.

Ph.D. DEGREE

For admission to the department the same policy holds as for the M.S. applicant. The flexible Ph.D. program is also arranged in committee with the student, his adviser, and four other faculty members participating. Special emphasis is placed on developing the student's research aptitude. The candidate must meet all the requirements set by the Graduate School. Although a qualifying examination is required for all transfer students, the final one for the M.S. degree may serve in lieu of this examination for those students who continue in the department's graduate program. The language requirement can be met by appropriate credit in one language or one collateral field. A written and oral comprehensive examination, a dissertation, and a final oral examination are required.

EXTENSION EDUCATION

JOHN G. GROSS, Ph.D., University of Nebraska.
Chairman; Director of Graduate Studies; Assoc. Prof.

DELMAR HATESOHL, Ph.D., Oklahoma State University. Prof.

RICHARD L. LEE, Ph.D., University of Iowa. Prof.
RANDEL K. PRICE, Ph.D., University of Wisconsin.

EILEEN G. LINEBERRY, M.S., University of Missouri-Columbia. Assoc. Prof.

ELWOOD LESLIE, Ph.D., University of Illinois.
Assoc. Prof.

GEORGE P. ROWE, Ph.D., Florida State University. Assoc. Prof.

The Department of Extension Education provides graduate work leading to the Master of Science degree. The extension idea, a function of a land-grant university, has spread around the world and students in the department come from several states and many countries.

The department program is designed for students whose interests lie in the fields of extension and/or informal adult education. Course work within the department in-

cludes program development, evaluation, adult learning, educational methods, organization, and administration. The department cooperates closely with related areas of study, and degree candidates are encouraged to select a minor or at least an area of concentration from such departments as Regional and Community Affairs, Sociology, Recreation, and in related courses in Education. Appropriate emphasis is given to research and its relationship to the extension function of a university.

The department provides access to numerous non-cataloged extension and adult education materials prepared by state and national organizations.

Department staff members hold joint appointments in the department and in the University of Missouri-Columbia Extension Division. This arrangement gives students access to field training and other opportunities for direct experience and education in the programs of the Extension Division.

Admission to the program is limited to those students who have completed a baccalaureate degree and who have had a minimum of two years extension or related informal teaching experience.

In addition, selection is based upon the following criteria: (1) An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted on the basis of this record alone. (2) Acceptable performance on the GRE required by the Graduate School may qualify a student where the undergraduate grade point is questionable. Consideration will be given to grade trends, performance in the major area of study, experience, and maturity.

Students from countries other than the United States are required to make satisfactory scores on the Test of English as a Foreign Language. See the Admissions section elsewhere in this bulletin for details.

The M.S. Program requires a minimum of 32 semester hours of course work, of which at least 16 must be at the 400 level. The program of study is selected in consultation with an assigned adviser.

A thesis is not required, but a Special Problem Research report is required of all candidates. A maximum of four hours' credit will be allowed for this report.

Refer to the regulations on Master's degrees elsewhere in this bulletin for residence requirements and information on examinations.

FINANCE

DAVID A. WEST, Ph.D., University of Arkansas. Chairman; Director of Ph.D. Program in Finance; Prof.

FRANCIS L. STUBBS, Ph.D., University of Wisconsin. Director of MBA Programs; Prof.

LEWIS E. DAVIDS, Ph.D., New York University. Prof.

RAYMOND W. LANSFORD, Ed.D., New York University. Prof.

JOHN J. PASCUCCI, Ph.D., Stanford University. Prof.

ROBERT E. BRAY, A.M., University of Missouri-Columbia. Assoc. Prof.

JACK E. GAUMNITZ, Ph.D., Stanford University. Visiting Assoc. Prof.

MELVILLE PETERSON, Ph.D., University of Illinois. Assoc. Prof.

GEORGE E. PINCHES, Ph.D., Michigan State University. Assoc. Prof.; Faculty Research Associate

MICHAEL L. LAWRENCE, M.B.A., University of Houston. Asst. Prof.

ROBERT J. MONROE, D.B.A., Indiana University. Asst. Prof.

JAMES S. TRIESCHMANN, D.B.A., Indiana University. Asst. Prof.

The Department of Finance joins with the Department of Management and the Department of Marketing in offering programs leading to the degrees of Master of Business Administration and Doctor of Philosophy in Business Administration.

Program information and requirements for admission and for completing the degrees are given under the heading, "Area of Business Administration," in this bulletin. For information pertinent to the Departments of Marketing and Management, see their entries in this bulletin.

A candidate may complete his M.B.A. degree in as little as 30 hours, or in one year if his undergraduate preparation is such that the first year M.B.A. courses are waived. Otherwise the M.B.A. degree could require a program of up to 59 hours. The program of study for the Ph.D. candidate is formulated by his Advisory Committee.

A candidate for the M.B.A. degree in finance selects an adviser from the Department of Finance and designates finance

as his area of concentration. A candidate for the Ph.D. in Business Administration with concentration in finance selects his adviser from the Department of Finance and writes his dissertation in this subject area.

Graduate students in finance pursuing individual and group research projects find the facilities of the campus Computational Services Center and of the Research Center of the School of Business and Public Administration most helpful. Students have access to the COMPUSTAT service of Standard Statistics Company, the MICROSTAT service of Edward D. Jones & Company, a micro-card collection of annual reports of all companies listed on the New York Stock Exchange, Moody's, and other investment services.

The Department of Finance ordinarily has two or three assistant instructorships available each academic year for Ph.D. candidates in Business Administration with stipends ranging to \$3,900. The department also grants a number of graduate scholarships and fellowships varying in amount from \$500 to \$2,500. Several research assistantships in the B&PA Research Center are awarded annually to graduate students in finance.

In addition to the degree information under Business and Public Administration, the student should refer also to the Regulations of the Graduate School as they apply to the Master's and Doctor's degrees. For information not given in this bulletin, write the chairman of the department.

FOOD SCIENCE AND NUTRITION

DEE M. GRAHAM, Ph.D., Iowa State University.
Chairman; Prof.

J. E. EDMONDSON, Ph.D., Iowa State University.
Director of Graduate Studies; Prof.

MILTON E. BAILEY, Ph.D., Louisiana State University. Prof.

RUTH E. BALDWIN, Ph.D., University of Wisconsin. Prof.

HAROLD J. BASSETT, Ph.D., University of Wisconsin. Prof.

OWEN J. COTTERILL, Ph.D., Ohio State University. Prof.

MARION L. FIELDS, Ph.D., Purdue University. Prof.

HAROLD B. HEDRICK, Ph.D., University of Missouri-Columbia. Prof.

ROBERT T. MARSHALL, Ph.D., University of Missouri-Columbia. Prof.

H. DONALD NAUMANN, Ph.D., University of Missouri-Columbia. Prof.

JOHN M. WELCH, Ph.D., University of Florida. Prof.

WILLIAM C. STRINGER, Ph.D., University of Missouri-Columbia. Assoc. Prof.

Graduate work in the Department is designed to develop students for various professional careers in the food industry. The food industry—the largest industry in the world—provides many rewarding opportunities for the student trained at the graduate level. Selected careers include food plant supervision, technical operation, quality control, product procurement, product development, transportation, sales, and regulatory work. Some students will find further opportunities in teaching and research at the college level and research for private industry or the Federal government.

The Food Science and Nutrition Department works very closely with all segments of the food industry. Cooperation with the food industry is excellent in both on- and off-campus programs. Most students work with industry-related research problems while some work directly with industry through a summer field training program. Special facilities for food science study and research include: (1) chemical and microbiological laboratories equipped with the latest basic and analytical equipment; (2) pilot plants to study heat processing, concentrating, dehydration, and freezing of meats, milk products, egg products, fruits, and vegetables; (3) options for study in food processing, food service, and food distribution; and (4) the University of Missouri-Columbia Library presently includes subscriptions to 221 serials pertaining to food science, and a large number of food patents are included in its listing.

Teaching and research assistantships are available to qualified students from funds provided by the Agriculture Experiment Station and research contracts. Fellowships supported by industry and professional societies are also available; these are based on national competition. Applications for assistantships and/or fellowships should be submitted to the Department of Food Science and Nutrition, 1-74 Agriculture

Building, by January 1 of each year. Additional information pertaining to courses of study, assistantships, or other material can be obtained from the Department Chairman.

MASTER OF SCIENCE DEGREE REQUIREMENTS

The Master's degree is primarily designed for individuals who are interested in specializing in areas of food science, food service, or food distribution. The individual program will be built around a core of courses in Food Science, with supporting courses from the disciplines of Chemistry, Microbiology, Physiology, Economics, Marketing, Management, and Statistics.

Admission requires a B.S. or A.B. degree and an undergraduate record which indicates promise for successful completion of graduate studies. Selection of students is based on requirements of the Graduate School plus the following departmental requirements: consideration of the grade trends, performance in major area of study, and other criteria established by the department.

To satisfy degree requirements, a candidate must: (1) complete the program of study as proposed by the advisory committee and student; (2) pass a comprehensive written and/or oral examination covering the student's program; (3) prepare a thesis or, if the student chooses a non-thesis option, prepare a research paper in the format required for submission to a reference journal; and (4) pass a final oral examination over course work and research problem. The thesis or research paper will be reviewed by each member of the final examining committee.

Additionally, the student must comply with residence requirements, grade point requirements, application procedures, and related matters specified elsewhere in this bulletin.

DOCTOR OF PHILOSOPHY DEGREE REQUIREMENTS

The Doctor of Philosophy is designed to prepare students for teaching, research, or other professional careers in food science, food service, or food distribution.



This program requires at least two years beyond the Master's.

A student desiring a Ph.D. must be admitted to the Graduate School, be accepted by the Department of Food Science and Nutrition, and have satisfactorily completed a Master's degree program (or its equivalent). Acceptance will be based on the following: (1) satisfactory completion of the Master's degree program or its equivalent with a GPA equal to or higher than that required by the Graduate School; (2) satisfactory completion of the oral qualifying examination; (3) evidence of satisfactory performance in the major area of study, inclusive of grade trends; and (4) compliance with other Graduate School requirements for formal admittance to candidacy of the Ph.D.

The planning of the program of study shall be under the guidance of an advisory committee and shall consist of the following: (1) a course of study designed to fit the individual student's academic background and objectives; (2) acceptance of the completed Master's degree program; (3) approval of a language, collateral field, or research technique as required by the department; (4) a course of study consisting of approximately one-third research credit, the remainder of courses to be selected from Food Science and other supporting areas of Chemistry, Microbiology, Physiology, Economics, Marketing, Management, and Statistics; and (5) acceptance of a dissertation topic as proposed by the student.

To satisfy degree requirements, a candidate must complete the program of study as approved by the student's advisory committee, pass the comprehensive examination over the approved course of study,

and present an acceptable doctoral dissertation and defend it in a final examination. Additionally, a candidate must complete all residence, grade, and other requirements specified elsewhere in this bulletin.

FORESTRY

DONALD P. DUNCAN, Ph.D., University of Minnesota. Chairman; Director of Graduate Studies; Prof.

GENE S. COX, Ph.D., Duke University. Prof.

E. ALLEN MCGINNIS, Ph.D., New York State College of Forestry. Prof.

ANDREW J. NASH, Ph.D., New York State College of Forestry. Prof.

RICHARD C. SMITH, D.F., Duke University. Prof.

KENT T. ADAIR, Ph.D., Colorado State University. Assoc. Prof.

GREGORY N. BROWN, D.F., Duke University. Assoc. Prof.

J. MILFORD NICHOLS, M.S., University of Missouri-Columbia. Assoc. Prof.

LEE K. PAULSELL, M.S., University of Missouri-Columbia. Assoc. Prof.

R. BROOKS POLK, M.F., University of Montana. Assoc. Prof.

CARL D. SETTERGREN, Ph.D., Colorado State University. Assoc. Prof.

MERTON F. BROWN, JR., Ph.D., University of Iowa. Asst. Prof.

KENNETH C. CHILMAN, Ph.C., University of Michigan. Asst. Prof.

THOMAS M. HINCKLEY, Ph.D., University of Washington. Asst. Prof.

WILLIAM H. KEARBY, Ph.D., University of Wisconsin. Asst. Prof.

KENNETH E. MOORE, M.F., Yale University. Asst. Prof.

JAMES P. PASTORET, M.W.T., University of Michigan. Asst. Prof.

The School of Forestry offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy in Forestry. In addition, a student may complete supplemental courses leading to competence as a professional forester.

Forestry is the scientific discipline concerned with the production of goods and services from the forest and from related lands and waters. Graduate education in forestry at the University of Missouri-Columbia has three primary objectives. The first of these is to provide forest scientists to meet the research and teaching needs basic to the forestry profession. Such education may be taken at either the master's or the doctoral level. The second

objective is to provide greater depth in specialized fields for forestry graduates desiring a fifth year of professional education at the master's level. The third objective is to offer opportunity for professional forestry education to the holder of the baccalaureate degree with a major in one of the biological, physical, or social sciences.

Forestry graduates interested in research or teaching may concentrate much of their graduate course work in one or more of the related sciences with a thesis subject appropriate to forestry. The dissertation may be directed toward the solution of problems faced by the practicing forester or may consist of fundamental investigations pertinent to the solution of such problems.

Specialized graduate education is available in several subfields of Forestry: ecology, economics, entomology, genetics and tree improvement, hydrology, pathology, photogrammetry, physiology, policy, recreation, silviculture, soils, timber management, and wood technology.

The School of Forestry works closely with the Columbia Research Center of the United States Forest Service. Eight scientists on that staff hold appointments as research associates in the School. In addition, excellent cooperation is maintained with the Missouri Conservation Commission and the State Park Board.

The School of Forestry and the University have direct control of some 14,000 acres of forested lands on which forestry research is underway. These are in four tracts near Columbia, St. Louis, and Poplar Bluff and represent a variety of forest types and conditions. In addition, access to other forest lands, both State and Federal, is available through cooperative agreements.

Well-equipped wood technology, forest ecology, and forest physiology laboratories are located on the Columbia Campus. Investigators have access to the services of a chemical analytical laboratory, a large nuclear reactor, an IBM 360/65 computer, an electron microscope, and other specialized laboratories and equipment. The UMC Library, located one block from the School's headquarters, possesses an excellent collection of books and periodicals in Forestry and related fields.

At University Forest near Poplar Bluff, gauged research watersheds, a small ex-

perimental greenhouse, a research laboratory, and an experimental sawmill and dry kiln are available for both research and teaching use.

Admission for graduate work in Forestry is based upon three criteria: (1) performance on tests such as the GRE, the Miller Analogies Test, or other comparable tests should indicate graduate potential; (2) letters of recommendation by individuals qualified to evaluate scholarly capacity should be favorable; and (3) undergraduate scholastic performance should indicate competence for graduate work. Particular attention will be given the work of the last two years, or in the case of one who has been employed for several years, the type and quality of experience since completion of the undergraduate degree. A somewhat higher level on each of these criteria is expected for doctoral candidates than for those having the Master's degree as their objective.

Some graduate students qualify for McIntire-Stennis funds, Hatch Act support, or State research support for assistantships, or for NDEA or NSF Fellowships. Write the Director of the School of Forestry for specific information.

MASTER OF SCIENCE

The M.S. degree with a Forestry major is designed for students who have an undergraduate degree in Forestry or in one of the biological, physical, or social sciences basic to Forestry. Students with previous professional education in Forestry may wish to undertake preliminary preparation for both research and teaching through the master's program or they may wish to obtain greater depth in a specialized area of Forestry. Those without a previous baccalaureate degree in Forestry may wish to further their education in forest science or to attain professional competence by completing the necessary course work at the master's level.

Course work which is required of students desiring a professional Forestry education without a previous Forestry degree include: Silvics; Practice of Silviculture; Forest Heredity; Forest Management; Forestry Economics; Mensuration and Inventory; Public Forestry Policy; Wood Industries III; and at least two of the following:

Forest Fire Control and Use, Forest Entomology, and Introduction to Plant Pathology. Several of these courses do not carry graduate credit.

To attain the Master's degree, 30 hours of course work must be completed, of which 15 hours or more shall be numbered 400 or above. Research, problems, special investigations, and special readings courses shall not exceed 8 of the 30 hours. The average of all course work submitted for the degree shall be *B* (3.0) or better.

A thesis or a minimum of 5 semester hours of non-thesis research acceptable to the student's graduate committee shall be completed prior to the final examination. A final oral examination is given all candidates prior to completion of the degree.

The master's candidate must comply with the time limitations, residence requirements, and other overall regulations indicated elsewhere in this bulletin.

DOCTOR OF PHILOSOPHY

The Ph.D. degree with a Forestry major is designed to prepare students for research, college teaching, or other advanced scientific or professional careers in Forestry. The student pursuing the doctoral program is expected to complete satisfactorily a qualifying examination, a comprehensive examination, and a final examination. The qualifying examination is intended to determine whether the student's background is adequate to enter upon the Ph.D. program, and to ascertain the student's areas of weakness in which he will be required to strengthen his background through appropriate course work. The comprehensive examination also has two objectives: to ascertain whether the student has acquired sufficient depth and breadth of knowledge in his area of concentration, and to evaluate his capacity to apply his knowledge in situations new to him and to integrate that knowledge toward the solution of problems, theoretical or applied. The final examination is directed primarily toward exploration of the dissertation.

Prior to his comprehensive examination, the student must have completed one of the following: (1) a demonstrated reading knowledge of the scientific literature in two languages other than English; (2) a reading knowledge of one foreign language plus proficiency in a collateral field defined

as the equivalent of 9 hours of graduate-level course work in the field, the latter in addition to the work normally required in the course program for the degree; (3) comprehensive knowledge of a single foreign language defined as ability to read, write, and speak the language with fluency; or (4) high proficiency in a collateral field, defined as the equivalent of 21 hours of graduate-level course work in the field beyond that normally required for the degree.

An independent scholarly dissertation on a subject approved by his adviser must be completed in a form acceptable to the final examining committee. At least two disciplines shall be represented on the committee.

In addition to the requirements outlined above, the doctoral candidate must comply with the time limitations, residence requirements, and other general regulations indicated elsewhere in this bulletin.

The requirements for this degree are not completely specified in terms of time or course work. Instead, the degree is conferred only upon those students who, after extensive study, have demonstrated high attainment in their particular specialization in Forestry and who have completed independent research contributing to knowledge in the field.

GEOGRAPHY

J. TRENTON KOSTBADE, Ph.D., University of Michigan. Chairman; Assoc. Prof.

WAYNE L. DECKER, Ph.D., Iowa State University; Prof. of Atmospheric Science

ANDREAS GROTEWOLD, Ph.D., University of Chicago. Prof.

JESSE H. WHEELER, JR., Ph.D., University of Chicago. Director of Graduate Studies; Prof.

WILLIAM A. NOBLE, Ph.D., Louisiana State University. Asst. Prof.

WALTER A. SCHROEDER, M.A., University of Chicago. Instructor

The Department of Geography offers graduate work in two plans leading to the Master of Arts degree. Plan I includes a thesis; Plan II does not. Both require 32 hours of graduate credit.

Graduate programs in Geography prepare students for teaching at the high school, junior college, and college levels; for jobs in urban and regional planning; and for various positions in government

service in such areas as resource management, cartography, and intelligence.

The Department emphasizes close contact between staff and graduate students and individualized graduate programs allowing latitude in areas of specialization, although emphasis is placed on North America, physical geography, economic geography, South Asia, and world regional geography. Strong collateral course work in such fields as Anthropology, Atmospheric Science, Computer Science, Economics, Geology, History, Planning, and Sociology contributes to the special interests of many graduate students.

An exceptional departmental collection of reference materials—including maps, journals, books, and aerial photographs—is available to graduate students. The holdings of the main library in Geography and related fields are extensive, and the University of Missouri-Columbia's computer facilities are readily available.

Ten to fifteen Graduate Teaching Assistantships and two Correspondence Grading Assistantships are available. They are awarded on a competitive basis. Applicants desiring consideration for one of these positions should indicate this in their applications to the department.

Applicants for the Master of Arts program with an undergraduate GPA of at least 3.0 ($A=4$) during the last two years of undergraduate work may be admitted on the basis of this record alone. Certain circumstances may qualify some applicants with lower grade point averages. Letters of recommendation may be used to strengthen applications. All applicants should submit scores on the Graduate Record Examination to the department as early as possible. These scores should include the Verbal and Quantitative parts of the examination and may include the Geography part or other subject-matter part. Address inquiries to Chairman, Department of Geography, McAlester Hall, UMC, Columbia, Missouri 65201.

THE M.A. DEGREE

Undergraduate preparation for graduate work in Geography should normally include a minimum of 18 semester hours in undergraduate courses in Geography. Students with excellent undergraduate records, including considerable work in fields close-

ly related to Geography, may sometimes be admitted to graduate work with fewer undergraduate hours, but may be required to extend their graduate programs to remedy deficiencies.

The Master of Arts degree requires completion of 32 semester hours of course work, eight of which may be thesis research if the student is on Plan I. Fifteen or more of these hours must be in courses numbered 400 or above. The program of courses is selected jointly by the student and the staff member whom he chooses as adviser during his first semester in residence. All candidates must pass a comprehensive written and/or oral examination at the end of their graduate work. Those who write theses must each make a successful defense of the thesis.

GEOLOGY

STANLEY N. DAVIS, Ph.D., Yale University.
Chairman; Prof.

RAYMOND L. ETHINGTON, Ph.D., University of Iowa. Prof.

WILLIAM D. JOHNS, Ph.D., University of Illinois. Prof.

WALTER D. KELLER, Ph.D., University of Missouri-Columbia. Prof. Emeritus

RAYMOND E. PECK, Ph.D., University of Missouri-Columbia. Prof.

ATHEL G. UNKLESBAY, Ph.D., University of Iowa. University Vice President for Administration; Prof.

ALDEN B. CARPENTER, Ph.D., Harvard University. Assoc. Prof.

JAMES E. CASE, Ph.D., University of California. Assoc. Prof.

DAVID K. DAVIES, Ph.D., University of Wales. Assoc. Prof.

THOMAS FREEMAN, Ph.D., University of Texas. Assoc. Prof.

PAUL B. HOSTETLER, Ph.D., Harvard University. Assoc. Prof.

CLAYTON H. JOHNSON, Ph.D., Cornell University. Assoc. Prof.

GEORGE W. VIELE, Ph.D., University of Utah. Assoc. Prof.

JAMES H. STITT, Ph.D., University of Texas. Director of Graduate Studies; Asst. Prof.

The Department of Geology offers graduate work leading to the Master of Arts, Master of Science for Teachers, and the Doctor of Philosophy degrees. The areas of specialization which a graduate student may pursue are carbonate petrology, clay mineralogy, X-ray crystallography, geo-

chemistry, geophysics, groundwater geology, igneous petrology, metamorphic petrology, micropaleontology, ore deposits, invertebrate paleontology, sedimentation, stratigraphy, and structural geology.

Adequate space and excellent facilities are available for research in the Geology building, which was dedicated in 1964. Modern equipment, including various X-ray instruments, are available for student use; an extensive Geology Library is also housed within the building. The Department maintains one of the best conodont collections in the world for teaching and research. The Geology Field Camp with permanent cabins is in the Wind River Mountains near Lander, Wyoming.

Several scholarships, assistantships, fellowships, and other sources of financial aid are available to graduate students in Geology. Write for information and forms: Department Chairman, Geology Building, UMC, Columbia, Mo. 65201.

GRADUATE PROGRAMS

Preparation for graduate work in Geology should include a minimum of 24 semester hours in geology plus at least 6 semester hours in an approved field course (or equivalent field experience); 8 semester hours of chemistry (physical chemistry for students specializing in mineralogy, petrology, or geochemistry); 5 semester hours in physics; 8 semester hours in analytical geometry, calculus, or statistics; and 5 semester hours in zoology or biology. Students specializing in paleontology should have work in invertebrate zoology and genetics. A reading knowledge of at least one foreign language is desirable.

Students enrolled for graduate credit in any course are required to have shown proficiency in the course or courses specifically listed as prerequisites. Normally this is interpreted to mean attainment of a grade of at least C (undergraduate) or B (graduate).

Candidates for the Master of Arts and Doctor of Philosophy degrees are required to submit aptitude and advanced scores on the GRE as a prerequisite for registration in course 490 (thesis or dissertation research).

The degree Master of Science for Teachers with concentration in Geology is offered with the intent that the candidate achieve

a level of competence in Geology equal to that of a Bachelor's degree with a major in Geology. The curriculum requirements are 30 semester hours in Geology (credits from outside the University of Missouri not transferable) including at least one 400-level course and a field course. Up to 4 semester hours may be taken outside the Department of Geology (mathematics, physics, chemistry, zoology, and botany). Written and oral comprehensive examinations are required for the degree.

GERMANIC AND SLAVIC LANGUAGES

ADOLPH E. SCHROEDER, Ph.D., Ohio State University. Chairman; Prof.

ERNST BRAUN, Ph.D., University of Wisconsin. Director of Graduate Studies; Prof.

DENNIS M. MUELLER, Ph.D., Washington University. Assoc. Prof.

LIVERNE WALTON, Ph.D., Indiana University. Assoc. Prof.

ILMARS BIRZNIKS, Ph.D., Tulane University. Asst. Prof.

KARL-HEINZ BOEWE, Ph.D., Rice University. Asst. Prof.

JAMES M. CURTIS, Ph.D., Columbia University. Asst. Prof.

OLGA C. SHOPAY, Ph.D., Ohio State University. Asst. Prof.

The Department of Germanic and Slavic Languages offers a course of study leading to the Master of Arts in German. The program is designed to prepare students for professional language careers and for advanced doctoral work. Special facilities for study include extensive library holdings for reading and research in Germanic literature and linguistics and in electronically equipped audio-visual laboratory for additional language training. The opportunity for supervised teaching experience is available to students who qualify for graduate assistantships in the department.

Applicants for admission to the graduate program should have an undergraduate degree from an accredited college or university, or the equivalent; a grade average of *B* or better; and an undergraduate German major, or the equivalent. In all cases the department reserves the right to evaluate the work presented for admission and to determine the student's needs. All regulations of the Graduate School governing

entrance requirements and Master's degrees, as set forth in this bulletin, apply.

Students must complete a minimum of 30 semester hours, selected from courses receiving graduate credit, with a grade average of *B* or better. No fewer than 24 of these hours are to be earned in German courses, and at least 15 hours must be in German courses numbered 400 or above. Courses taken outside the department will be decided in consultation with the candidate's adviser. Generally, such courses are chosen from English, Romance, Russian, or Classical Literature; Linguistics or Philology; History; Art History; or Philosophy. Other fields may be considered. No language other than German is required. The Department does not require a thesis. Information concerning specific course requirements can be obtained by writing to the chairman of the department.

Candidates for the M.A. degree must pass comprehensive written and oral final examinations based on course work and the departmental reading list.

HISTORY

NOBLE E. CUNNINGHAM, JR., Ph.D., Duke University. Chairman; Prof.

CHARLES G. NAUERT, JR., Ph.D., University of Illinois. Director of Graduate Studies; Prof.

THOMAS B. ALEXANDER, Ph.D., Vanderbilt University. Prof.

LEWIS E. ATHERTON, Ph.D., University of Missouri-Columbia. Prof.

W. FRANCIS ENGLISH, Ph.D., University of Missouri-Columbia. Prof.

RICHARD S. KIRKENDALL, Ph.D., University of Wisconsin. Prof.

JOHN LANKFORD, Ph.D., University of Wisconsin. Prof.

FORDYCE W. MITCHEL, Ph.D., Yale University. Prof.

CHARLES F. MULLETT, Ph.D., Columbia University. Prof.

PAUL C. NAGEL, Ph.D., University of Minnesota. Prof.

WALTER V. SCHOLES, Ph.D., University of Michigan. Prof.

ARVARH E. STRICKLAND, Ph.D., University of Illinois. Prof.

HAROLD D. WOODMAN, Ph.D., University of Chicago. Prof.

N. GERALD BARRIER, Ph.D., Duke University. Assoc. Prof.

RICHARD T. BIENVENU, Ph.D., Harvard University. Assoc. Prof.

GERARD H. CLARFIELD, Ph.D., University of California-Berkeley. Assoc. Prof.
 CHARLES B. DEW, Ph.D., Johns Hopkins University. Assoc. Prof.
 GEORGE W. FASEL, Ph.D., Stanford University. Assoc. Prof.
 KONRAD HUGO JARAUSCH, Ph.D., University of Wisconsin. Assoc. Prof.
 CLAUDIA KREN, Ph.D., University of Wisconsin. Assoc. Prof.
 JOHN C. RAINBOLT, Ph.D., University of Wisconsin. Assoc. Prof.
 ROBERT J. ROWLAND, JR., Ph.D., University of Pennsylvania. Assoc. Prof.
 ROBERT E. RUGH, Ph.D., Harvard University. Assoc. Prof.
 DAVID P. THELEN, Ph.D., University of Wisconsin. Assoc. Prof.
 WILLIAM M. WIECEK, Ph.D., University of Wisconsin. Assoc. Prof.
 WINFIELD J. BURGGRAFF, Ph.D., University of New Mexico. Asst. Prof.
 WERNER DEICH, Ph.D., Free University of Berlin. Asst. Prof.
 EDWARD A. PURCELL, Ph.D., University of Wisconsin. Asst. Prof.
 CHARLES E. TIMBERLAKE, Ph.D., University of Washington. Asst. Prof.
 SELWYN K. TROEN, Ph.D., University of Chicago. Asst. Prof.
 RUSSELL ZGUTA, Ph.D., Pennsylvania State University. Asst. Prof.

The Department of History offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy. Lecture courses, seminars, and directed research are available in the following fields: ancient, medieval, and modern Europe; Russia; England and the British Empire; South Asia; Latin America; and all aspects of American history. While students are expected to get specialized training in the fields of their choice, they are also urged to develop a broad historical background. With the cooperation of other departments at the University of Missouri-Columbia, students may work out programs which provide for interdisciplinary specialization.

The UMC Library has substantial research holdings in all fields in which graduate training is offered, and there are specialized collections which are of the first importance. The Western Historical Manuscripts Collection is a unique depository of material for regional studies in political, social, and economic history, while the State Historical Society of Missouri has an

outstanding library of primary and secondary works dealing with Missouri history. The UMC Library possesses an unusual collection of more than five thousand pamphlets which are invaluable for seventeenth and eighteenth century British history; there are substantial holdings of eighteenth and nineteenth century British and continental journals, including the publications of all the major academies; and the Medical School Library has excellent published materials for the history of medicine. In addition, the program in recent United States history has available the resources of the Truman Library at Independence, Missouri. Microfilm readers are available, one within the department and others in the UMC Library.

The Department of History provides qualified students with the opportunity to gain teaching experience on the college level. The teaching assistantship is an appointment with a current stipend of \$2,640. Students holding a teaching assistantship conduct six hours of discussion sections each week in American or European history. Teaching assistants may carry twelve academic credits each semester and participate in full government benefits in addition to their University stipends. The appointment is subject to annual review and may be held for a total of three years.

Research assistantships are available on a part-time basis. Students holding a research assistantship will be assigned to a senior faculty member to work on a specified project.

Research appointments available in the State Historical Society of Missouri and the Western Historical Manuscripts Collection carry stipends comparable to graduate assistantships, and employment at an hourly rate also is open to graduate students in history. For information concerning these opportunities write: Dr. Richard S. Brownlee, Secretary, State Historical Society, 3 Library, UMC, Columbia, Missouri 65201. A number of fellowships and research grants are available to qualified students.

The UMC Graduate School offers a number of fellowships and scholarships. Students interested in such grants should apply directly to the Dean of the Graduate School, 205 Jesse Hall. Recipients of such

awards are not permitted to hold assistantships.

A number of appointments are available as graders for independent study courses in the Extension Division of UMC and in undergraduate lecture courses in the Department of History. Compensation varies according to the time required.

Fellowship and assistantship application forms and further information concerning financial aid or degree programs may be obtained by writing the Director, History Graduate Studies, 143 Arts and Science Building.

Completed applications for financial aid must be filed not later than February 1. Announcements of awards will be made by April 1.

M.A. REQUIREMENTS

To be considered as a candidate for the M.A., an applicant must have a B.A. or a B.S. degree with a minimum of 18 upper-class hours of history and a GPA of 3.0 (on a 4.0 scale). Students with a B.S. in Education and a major in Social Studies must have a total of 21 undergraduate hours in history. Students who lack the necessary hours will take course work beyond the required 30 hours to remedy their deficiency. Remedial hours must be completed before the student will be recognized as an M.A. candidate. The GRE is required. The Department reserves the right to evaluate the work presented for admission and to determine the student's needs.

For the assignment of an adviser, the student should see the Director of History Graduate Studies. To satisfy degree requirements, a student should complete a minimum of 30 hours of graduate credit, including at least 20 in history and at least 15 in 400-level courses. Two seminars are required. There is no thesis requirement. Electives are to be selected in consultation with the student's adviser.

Although the Department does not require a reading knowledge of a foreign language for the M.A., all candidates are urged to pass their examination in at least one language during the first year of graduate work. This will be required of teaching assistants.

For other regulations and requirements involved in obtaining a Master's degree, see that section in this bulletin.

If a student expects to continue work toward the Ph.D., his grade record for the M.A. must be outstanding. The Department strongly advises students not to attempt the Ph.D. unless they have achieved a grade of *A* in a minimum of half of their courses on the Master's program.

Ph.D. REQUIREMENTS

Early in their first semester, graduate students should arrange with the Director of History Graduate Studies for a preliminary advisory committee. The committee will administer the oral qualifying examination to potential candidates in the first week of their second semester of graduate work following completion of the M.A. degree. A student whose M.A. is from UMC may substitute his M.A. final for the Ph.D. qualifying examination provided his performance thereon was judged outstanding. Acceptance as a doctoral candidate follows passing of the qualifying examination. The candidate, with his adviser, chooses his dissertation field and plans a program of study. The comprehensive examination will be both written and oral and will cover all fields offered for the Ph.D., including the dissertation field.

For a Ph.D. in U.S. history, a candidate must offer (1) a general U.S. history field, broad in scope and emphasizing major trends; (2) a non-U.S. history field; (3) a special field, which may or may not be in history; and (4) a dissertation field. A candidate may choose his dissertation field from the following: American Colonial and Revolutionary (to 1787), The National Period (1787-1877), Recent United States (1877-present), The South, The West, Diplomatic History, Social History, Economic History, Intellectual History, Constitutional History, Urban History, and Negro History.

For a Ph.D. in non-U.S. history, a candidate must offer four fields in history, one of which will be the field of his dissertation, and one field outside history. In each of these fields the candidate will be expected to have a general knowledge of the field as a whole. His choices will be

from the following 15 fields: Greece, Rome, Medieval, Renaissance and Reformation (1300-1600), Early Modern Europe (1555-1789), England and the British Empire (1485-1789) and England and the British Empire (1789-present), Modern Europe (1789-present), France (1789-present), Germany (1789-present), Kievan Rus' and Muscovite Russia, Russia (Peter the Great to the present), India, History of Science, and Latin America. He may choose one of the U.S. fields as one of his four fields, but not for his dissertation field.

Before being admitted to the Comprehensive Examination, a candidate must meet the requirements in two languages. The first language should be passed in the first semester of residence, or formal course work must be started then to fulfill this requirement. The requirement for the second language may be satisfied in one of four ways: an ETS examination, nine semester hours of college-level course work passed with a C or better, substitution of a Research Technique, or a demonstration of high ability in the first language as verified by the language department involved.

The doctoral dissertation is written under the direction of the candidate's adviser. The final examination will be oral and open to the public. It will be both a defense of the dissertation and an examination of the field in which the dissertation lies.

HOME ECONOMICS

MARGARET W. MANGEL, Ph.D., University of Chicago. Director of Graduate Studies; Prof., Food & Nutrition
HELEN S. ALLEN, M.S., Iowa State University. Prof., Clothing & Textiles
GEORGIA M. AMICK, M.S., Iowa State University. Prof., Food & Nutrition
GORDON E. BIVENS, Ph.D., Iowa State University. Prof., Family Economics & Management
JOSEPH FALSETTI, M.A., Ohio State University. Prof., Housing & Interior Design
ELIZABETH S. HENSLEY, M.S., Cornell University. Prof., Food & Nutrition
C. BUD KAUFMANN, Ph.D., Florida State University. Prof., Housing & Interior Design
RUTH N. LUTZ, Ph.D., Cornell University. Prof., Food & Nutrition

EDWARD J. METZEN, Ed.D., University of Missouri-Columbia. Prof., Family Economics & Management
AIMEE MOORE, Ph.D., Michigan State University. Prof., Food & Nutrition
ELINOR NUGENT, Ph.D., Louisiana State University. Prof., Clothing & Textiles
RICHARD RANKIN, M.A., Stanford University. Prof., Housing & Interior Design
KATE ELLEN ROGERS, Ed.D., Teachers College, Columbia University. Prof., Housing & Interior Design
DORIS SAXON, M.S., University of Alabama. Prof., Clothing & Textiles
BYRDINE TUTHILL, M.S., University of Wisconsin. Prof., Food & Nutrition
JOHN T. TYPO, Ph.D., University of Minnesota. Prof., Food & Nutrition
CHRISTINE WEAVER, Ph.D., Iowa State University. Prof., Food & Nutrition
HELEN ANDERSON, Ph.D., University of Wisconsin. Assoc. Prof., Food & Nutrition
MARILYN W. CASELMAN, M.S., Ohio State University. Assoc. Prof., Family Economics & Management
VIRGINIA FISHER, Ph.D., University of Missouri-Columbia. Assoc. Prof., Child & Family Development
MARGARET FLYNN, Ph.D., University of Missouri-Columbia. Assoc. Prof., Food & Nutrition
GARY L. HENNIGH, M.F.A., University of Colorado. Assoc. Prof., Housing & Interior Design
JOSEPHINE M. HOLIK, M.A., Virginia Polytechnic Institute. Assoc. Prof., Clothing & Textiles
ORRINE Z. GREGORY, M.S., University of Missouri-Columbia. Assoc. Prof., Home Economics
FRANCES MCKELVY, M.S., State University of Iowa. Assoc. Prof., Food & Nutrition
MARIAN SPEARS, Ph.D., University of Missouri-Columbia. Assoc. Prof., Food & Nutrition
CAROLYN WINGO, M.A., Teachers College, Columbia University. Assoc. Prof., Clothing & Textiles
ANNA CATHRYN YOST, M.S., Purdue University. Assoc. Prof., Family Economics & Management
CAROL BOICE, Ph.D., Ohio University. Asst. Prof., Child & Family Development
BRUCE CAMPBELL, Ph.D., University of Minnesota. Asst. Prof., Child & Family Development
LELLAND GALLUP, Ed.D., University of Missouri-Columbia. Asst. Prof., Housing & Interior Design
JEAN B. GRIFFIN, M.S., University of Missouri-Columbia. Asst. Prof., Clothing & Textiles
RICHARD HELMICK, M.F.A., Ohio State University. Asst. Prof., Housing & Interior Design
ANN HERTZLER, M.S., Drexel Institute of Technology. Asst. Prof., Food & Nutrition

The School of Home Economics offers graduate study in the various disciplines within Home Economics. The degrees offered are Master of Arts, Master of Science, and Doctor of Philosophy. The choice of an M.S. or an M.A. degree depends on the nature of the program, for instance, M.A. for history of costume emphasis; M.S. in foods.

Because of the impact of rapidly changing living situations on individuals and families, program emphasis is placed upon interrelationships of human factors with physical aspects of food, clothing, and shelter within the environment.

Master's degree programs are planned individually to meet the needs and objectives of the students. Subject areas which may serve, singly or in combination, as a focus for the Master's program include: child development, family life, food, nutrition, food service systems management, clothing, textiles, housing, interior design, home management, family economics, and home economics communication. Students with these Master's degrees are much in demand for extension and other government service, or for teaching at secondary and college levels.

In combination with appropriate course work in the College of Education these degrees may lead to certificates of specialization for teaching in college or junior college. Masters' degrees with emphasis in the listed areas of Home Economics are also offered through Extension Education in the College of Agriculture and through Home Economics Education in the College of Education.

The program for the Ph.D. is designed to prepare students for research, college teaching, or other advanced professional careers in which a high degree of understanding and competence in the field is required.

The first Ph.D. degree was offered through Home Economics in 1927 when one of seven granted by the University of Missouri-Columbia was in nutrition. While emphasis in food and nutrition has continued, other fields in Home Economics have been strengthened to the point of

allowing degree emphasis. The Ph.D. program in Home Economics relates environmental aspects of food, clothing, or shelter to human needs, or deals specifically with family development, economics, or management. These programs are planned individually on an inter-departmental or intersectional basis.

Because of the very rapidly increasing enrollment, both at the undergraduate and graduate level, space and facilities are at a premium. However, appropriate laboratory and work space is available for graduate study and research in Gwynn and Stanley Halls and in the Home Management Center. Special facilities include animal and human areas in Gwynn Hall's newly renovated nutrition laboratories and in humidity- and temperature-controlled areas for textile research and for research and observation in three Child Development laboratories. Costume collections and fabric collections are housed in Stanley Hall. Visual records of Missouri costume are also available for use by graduate students. Additional opportunities are available in the Medical Center, the Experiment Station laboratories and the whole body counter, and research reactor facilities. Students in Food and Nutrition make considerable use of the Medical School Library; students planning historical studies use documents of the State Historical Society of Missouri. The UMC Library is close at hand and provides excellent resources.

Research opportunities and facilities in the School of Home Economics are extended by cooperation with other schools and divisions on campus. The College of Education, through the Coordinator of Home Economics Education, provides opportunities for certification of specialization in addition to subject-matter degrees. The Director of the UMC Medical Center Department of Nutrition and Dietetics and other members of that staff are professional members of the School of Home Economics faculty. They act as advisers and provide for both research and teaching opportunities for graduate students with appropriate interests. The state staff in Home Economics Extension are also faculty members of the School of Home Economics. They work closely with the teaching and research staff in providing graduate

students opportunities for research and experience in both rural and urban areas. Increasing concern with urban problems, and with problems of the underprivileged of the State, make study and research in the various subject areas of Home Economics of vital importance. Also, the School of Home Economics participates in the Missouri Agriculture Experiment Station research program. Support from this source is supplemented by grants from other Federal agencies.

A number of teaching and research assistantships are available to qualified students at both Master's and Ph.D. levels. Some opportunities for part-time work are also available. Those connected with Agricultural Experiment Station Research may include research which leads to the thesis. Teaching assistantships provide for supervised experience in college teaching. Applications should be submitted by March 1 of each year, although inquiries may be made at any time. Information is also available on national fellowships for which the student might be considered. For application forms, write to the Director of the School of Home Economics.

MASTER'S DEGREE REQUIREMENTS

Requirements for entrance to the Master's degree programs are: (1) a GPA of 3.0 (on a 4.0 system) from an accredited college. Applicants with slightly lower averages may ask to have their credentials reviewed for evidence of potential success. Consideration is given to evidence of aptitude, motivation, and performance in the student's major area; (2) acceptable performance on the GRE (Part I), on the Strong Interest Inventory, and on the Edwards Personal Preference Test are required. These and the Ohio Psychological scores will be accepted for consideration with the applications.

Upon acceptance into the program, the adviser or advisory committee will determine what undergraduate course prerequisites are required to provide a sound basis for graduate study in the chosen field. This will include both the courses in areas which have not previously been studied and those in which a student's knowledge is not up-to-date.

The program of study is developed both to strengthen student deficiencies and to build strength in the area of interest and objectives. The minimum course requirements are 30 hours of graduate course work, including at least 15 in courses numbered 400 or higher. Not more than 12 hours of the 30 may be in problems or research.

The student must successfully complete some kind of independent study. Students normally enroll for 6-8 hours in thesis Research 490 or for 4-8 hours in non-thesis Research 450. Non-thesis research may lead to a paper, a publication or some other evidence of successful completion of the research or to some other type of report; for instance, a student in interior design might do a restoration study on an historic Missouri home with renderings of the restoration along with documentation constituting the report.

Students will be expected to comply with residence, time limitations, and other matters specified elsewhere in this bulletin.

Ph.D. DEGREE REQUIREMENTS

Before applying for admission to candidacy the student must be accepted by the faculty in the field of his major, and demonstrate by the quality of his course work for approximately 30 hours at the graduate level, that he is an above-average graduate student. Acceptance of a student to begin work upon a Ph.D. program will depend upon the qualifications of the student and the availability of faculty and facilities. Consideration is also given to grades in the major area of interest, maturity, experience, motivation, and other factors which would indicate successful completion of the program. A 3.0 or higher GPA is required in previous graduate work. Graduate aptitude test scores should indicate ability in the Ph.D. range and aptitude for the area being studied.

The student and his adviser will develop a preliminary program plan (taking into account the background, the strengths, weaknesses, and objectives of the student) which will serve as the basis of the final program to be approved by the student's advisory committee. This will constitute the course requirements for the degree. Courses must be completed with an aver-

age grade of *B*, as required by the Graduate School.

A written and/or oral qualifying examination, administered by the faculty of the student's subject area, must be completed satisfactorily before admission to candidacy. Students who have recently completed Master's degrees at UMC may request that the Master's examination be considered a qualifying examination for candidacy for the Ph.D. Students do not need to complete a Master's degree if they prefer to study for the Ph.D. A student is formally accepted for a Ph.D. program at the time he is admitted to candidacy, which usually occurs in the second year of graduate work, i.e., in the first year after a Master's program.

Comprehensive written and oral examinations covering the student's graduate work, a written dissertation based on original research, and an oral examination defending the dissertation must be completed as required by the Graduate School. Residence, time limitations, and other matters regarding Doctoral programs are described elsewhere in this bulletin.

HORTICULTURE

RAYMOND A. SCHROEDER, Ph.D., University of Missouri-Columbia. Chairman; Director of Graduate Studies; Prof.

DELBERT D. HEMPHILL, Ph.D., University of Missouri-Columbia. Prof.

AUBREY D. HIBBARD, Ph.D., University of Missouri-Columbia. Prof.

VICTOR N. LAMBETH, Ph.D., University of Missouri-Columbia. Prof.

MARLIN N. ROGERS, Ph.D., Cornell University. Prof.

JAMES E. SMITH, Jr., M.S.A., Purdue University. Prof.

CHARLES W. LOBENSTEIN, Ph.D., Purdue University. Assoc. Prof.

RONALD E. TAVEN, M.S., University of Minnesota. Assoc. Prof.

JOHN H. DUNN, Ph.D., Rutgers University. Asst. Prof.

DAVID E. HARTLEY, Ph.D., Oregon State University. Assoc. Prof.

LEON C. SNYDER, Jr., M.L.A., University of Michigan. Asst. Prof.

The Department of Horticulture offers graduate work leading to the Master of Science and Doctor of Philosophy degrees. Opportunities for graduate study in Horti-

culture are available in areas of floriculture, fruits, ornamentals, turf, vegetables, and weed science with emphasis on physiology and plant breeding. Students will also take course work in a number of disciplines directly related to Horticulture. The M.S. program offers opportunity for advanced study necessary for success in horticultural enterprises and agribusiness. The Ph.D. program prepares students for research and teaching and for advanced professional careers in agribusiness and other industry, or in State or Federal government agencies.

Well-equipped laboratories, plant growth chambers, and environmental-controlled greenhouses, and excellent outdoor laboratories and facilities are available to the student for biochemical, genetic, morphological and physiological studies in horticultural science.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. Applications should be submitted by March 1 each year. Write the department chairman for more information.

THE M.S. DEGREE

Entering students must meet the general requirements for entrance to the Graduate School. If a baccalaureate degree, other than a B.S. degree in Agriculture is offered, the candidate must have completed satisfactory work in at least 30 semester hours in science subjects.

All students will be required to take a qualifying examination to determine their proficiency in horticultural and science subjects and to guide the formulation of the study program. Additional university credits in these areas may be required if the examination indicates such need. Under the guidance of an adviser and the department chairman a course of study will be designed to fit each student's academic background, experience, and objectives. A student must complete a minimum of 30 semester hours of graduate work including at least 16 hours numbered 400 or higher. There is usually no language requirement for the Master's degree.

A thesis is required of all candidates. A candidate must fulfill the approved course of study with a grade average of *B* (3.0) or better and pass a written and/or oral examination at completion of course work

and dissertation. He must also comply with the general regulations of the Graduate School.

LOUIS E. FREUND, Ph.D., University of Michigan. Asst. Prof.

GLENN E. STAATS, Ph.D., University of Texas. Asst. Prof.

THE Ph.D. DEGREE

To be admitted to candidacy for a Ph.D. in Horticulture, the student in addition to meeting the general requirements for entrance to the Graduate School must demonstrate competency by a written and/or oral qualifying examination conducted by the Advisory Committee of at least five members appointed by the Dean of the Graduate School. A candidate must complete a program of study approved by the student's Advisory Committee.

The language requirement will be determined for each doctoral candidate by his Advisory Committee. This may involve (a) attaining a high level of proficiency in the translation into English of one foreign language other than the native tongue, (b) reading competency in two foreign languages, (c) reading competency in one language and competency in one collateral field as appropriate with the student's experience and objectives, or (d) the language requirement may be waived by the Advisory Committee and other proficiencies required.

A dissertation is required of each candidate. The research problem for the doctoral dissertation must be approved by the candidate's Advisory Committee. He must pass examinations and otherwise comply with residence, time limitations, and other matters specified elsewhere in this bulletin.

INDUSTRIAL ENGINEERING

JAY GOLDMAN, D.Sc., Washington University. Chairman; Prof.

H. ALLAN KNAPPENBERGER, Ph.D., North Carolina State University. Director of Graduate Studies; Prof.

JAMES M. BEAUCHAMP, JR., M.S., Lehigh University. Prof.

ROBERT M. EASTMAN, Ph.D., Pennsylvania State University. Prof.

MELVIN O. BRAATEN, Ph.D., North Carolina State University. Assoc. Prof.

LARRY G. DAVID, Ph.D., Purdue University. Assoc. Prof.

OWEN W. MILLER, D.Sc., Washington University. Assoc. Prof.

It is the objective of the graduate program in Industrial Engineering to provide a scholarly environment in which highly qualified, creative students may obtain the knowledge and develop the skills necessary to solve complex industrial, governmental, and societal systems design problems. Many of these systems are required to operate within increasingly complex constraints, thus necessitating the use of sophisticated and creative designs. The Industrial Engineer responsible for such designs must be capable of applying a broad spectrum of scientific tools if the most effective systems are to be obtained. The Master of Science program in Industrial Engineering is designed to provide a basic understanding of these tools, as well as an application experience wherein these tools are utilized in the design process. The Doctor of Philosophy program in Industrial Engineering is designed to provide the specialized knowledge and skills necessary to develop new tools or methods for solving complex systems design problems.

Admission to the Department's graduate programs is available to students with a baccalaureate degree from an accredited undergraduate curriculum in engineering, mathematics, statistics, or physical science, whose record indicates the ability to complete the program successfully. Several factors are considered in evaluating an applicant's capability, such as overall grade point average, grade trends, and major area grades. In addition, each applicant is required to take the General Aptitude portion of the Graduate Record Examination and submit two letters of recommendation from professors who are in a position to judge the applicant's potential performance in a graduate program. A student from a foreign institution is required to take the Test of English as a Foreign Language (TOEFL) prior to applying for admission.

In support of the academic program, laboratory facilities in several major application areas are available both within the Department and in other departments with related interests. Neighboring industries; city, county, and state government agen-

cies; the University of Missouri-Columbia Medical Center; the Missouri Regional Medical Program; local hospitals; and nearby large metropolitan centers provide an unlimited reservoir for research and design opportunities.

One of the most important tools required by a strong Industrial Engineering research and design program is a modern computer facility. An IBM 360, Model 50 operating on a fast access basis and an SEL 840A are available within the College of Engineering. An IBM 360, Model 50 is available at the Medical Center and a Model 65 is available at the Computational Services Center in the Mathematical Sciences building. In addition to the Main UMC Library facilities described in this *Bulletin*, an excellent collection of mathematical, statistical, and engineering books and reference materials are housed in the Engineering Library.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. These forms of financial assistance are supported by funds made available through the State of Missouri and Federal and industrial graduate support programs, as well as research grants from various industrial and governmental agencies.

Additional information, applications for admission and financial aid, and other *Bulletins* may be obtained by writing to: Director of Graduate Studies, Department of Industrial Engineering, UMC, Columbia, Missouri 65201, or by calling AC 314 449-8387.

M.S. DEGREE PROGRAM

There are two basic programs leading to the M.S. degree. The first is a thirty-credit-hour research-oriented program requiring a thesis. The second is a 36-credit-hour design-oriented non-thesis program. Both programs are built upon a fifteen-credit-hour core. There is no language requirement in either of these programs.

In order to accommodate a wide variety of undergraduate backgrounds, prerequisites have been minimized to allow students to complete the entire program in a reasonable period of time.

In general, students will be accepted for advisement in the M.S. program if their

undergraduate grade point average is at least 3.0 on a 4.0 scale, if an acceptable score on the General Aptitude portion of the Graduate Record Examination has been recorded, and if two favorable letters of recommendation are received. Students who do not satisfy the above minimal requirements, but who believe that unusual circumstances qualify them to do graduate work in Industrial Engineering, may apply for admission. A letter explaining the nature of these circumstances should be submitted to the Director of Graduate Studies. The Graduate Faculty of the Department will review such petitions on an individual basis.

DOUBLE M.S. DEGREE PROGRAM

The Department of Industrial Engineering, in cooperation with the Department of Community Health and Medical Practice in the School of Medicine, offers a 60-credit-hour double M.S. degree program which provides an educational experience to prepare its graduates for careers in the design and administration of health care delivery systems and organizations. The program was developed in recognition of the highly complex nature of health care organizations.

The basic objective of this program is to fuse together competencies in health services management with competencies in health systems design. This is accomplished by using the required courses in the Industrial Engineering program to serve as the area of specialization in the Public Health program, and by using the required courses in the Public Health program as electives in the Industrial Engineering program. As a result, it is possible for the student to earn an M.S. in Public Health and an M.S. in Industrial Engineering simultaneously. Upon satisfactory completion of this program, the student will be considered "a course graduate in hospital administration."

The specific requirements for the M.S. degree in Industrial Engineering are as described in the previous section.

Ph.D. DEGREE PROGRAM

The Ph.D. degree programs are individually tailored to satisfy students' objectives. However, the M.S. core courses also

Plan B is available to all other students. It will include, in addition to the four prerequisite courses in library science, at least 24 hours in library science and 6 hours in another subject, normally the undergraduate major. There is no thesis, but a research course (450) is required. Those students who have not had meaningful work experience in a library will be required to complete, in addition to the minimum program, a course in library practice.

MANAGEMENT

ROBERT G. COOK, D.B.A., Indiana University. Chairman; Prof.

EARL F. LUNDGREN, Ph.D., University of Wisconsin. Director of Ph.D. Program in Management; Assoc. Prof.

FRANCIS L. STUBBS, Ph.D., University of Wisconsin. Director of M.B.A. Programs; Prof. of Finance

DONALD S. HOLM, JR., Ph.D., Indiana University. Prof.

ROBERT C. MANHART, Ph.D., Ohio State University. Prof.

WILLIAM F. GLUECK, Ph.D., Michigan State University. Faculty Research Assoc., B&PA Research Center; Assoc. Prof.

ROBERT J. PAUL, Ph.D., University of Arkansas. Assoc. Prof.

EVERETT E. ADAM, JR., D.B.A., Indiana University. Asst. Prof.

EARL A. CECIL, D.B.A., Indiana University. Asst. Prof.

DAVID E. ROBERTSON, Ph.D., University of Wisconsin. Asst. Prof.

The Department of Management joins with the Department of Finance and the Department of Marketing in offering programs leading to the degrees of Master of Business Administration and Doctor of Philosophy in Business Administration.

Program information and requirements for admission and for completing the degrees are given under the Area of "Business Administration" in this bulletin. For information pertinent to the Departments of Finance and Marketing, see their entries in this bulletin.

A candidate may complete his M.B.A. degree in as little as 30 hours or in one year if his undergraduate preparation is such that the first-year M.B.A. courses are waived. Otherwise, the M.B.A. degree

could require a program of up to 59 hours. The program of study for the Ph.D. candidate is formulated by his Advisory Committee.

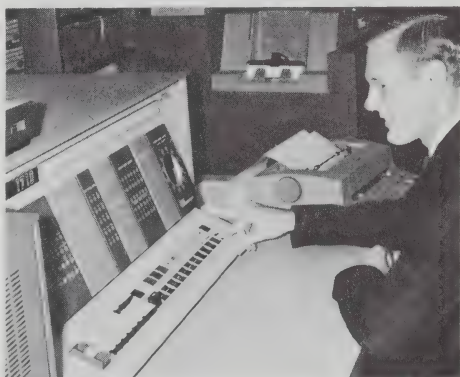
A candidate for the M.B.A. degree in Management chooses an adviser from the Department of Management and designates Management as his area of concentration. A candidate for the Ph.D. in Business Administration, in addition to selecting his adviser from the Management Department and to choosing Management as his area of concentration, also writes his dissertation in this subject area.

The department of Management cooperates with industry across the State in presenting learning situations to management students while working in problem-solving, analytical, and advisory capacities for industry's managers.

The Department works closely with the Department of Community Health and Medical Practice in the program for Health Services Management. This program can be completed with a Master of Business Administration, or an M.S. degree in Public Administration or in Public Health. The M.B.A. degree candidate in the field of Management will be expected to do work additional to that listed in the general requirements if he chooses Health Services Management as his area of concentration.

Management students have access to the facilities of the Computer Center, the computer terminal in the B.&P.A. Building, the B.&P.A. Research Center, and other research materials which apply.

The Department of Management has approximately eight teaching assistantships available for Ph.D. candidates in Business Administration, with stipends up to \$3,900.



In addition to the degree information under Business Administration, the student should refer also to the regulations of the Graduate School as they apply to the Master's and Doctor's degrees. For information not given in this bulletin, write the Department Chairman.

MARKETING

CARL E. BLOCK, Ph.D., University of Iowa. Chairman; Director of Ph.D. Program in Marketing; Assoc. Prof.

FRANCIS L. STUBBS, Ph.D., University of Wisconsin. Director of M.B.A. Programs; Prof. of Finance

NYLEN W. EDWARDS, D.B.A., Indiana University. Prof.

ROBERT D. SCHOOLER, Ph.D., University of Texas. Prof.

DONALD L. SHAWVER, Ph.D., University of Illinois. Prof.

DON R. WEBB, Ph.D., University of Illinois. Prof.

SAMUEL G. WENNBERG, Ph.D., Northwestern University. Prof.

JOHN R. DARLING, JR., Ph.D., University of Illinois. Assoc. Prof.

ROBERT A. MITTELSTAEDT, Ph.D., University of Minnesota. Assoc. Prof.

C. L. ABERCROMBIE, Ph.D., University of Illinois. Asst. Director of M.B.A. Programs—Columbia; Asst. Prof.

WILLIAM B. WAGNER, Ph.D., Ohio State University. Asst. Prof.

The Department of Marketing joins with the Department of Finance and the Department of Management in offering programs leading to the degrees of Master of Business Administration and Doctor of Philosophy in Business Administration.

Program information and requirements for admission and for completing the degrees are given under the area of "Business Administration" in this bulletin. For information pertinent to the Departments of Finance and Management, see their entries in this bulletin.

A candidate may complete his M.B.A. degree in 30 hours or in one year if his undergraduate preparation is such that the first-year M.B.A. courses are waived. Otherwise, the M.B.A. degree might require a program of 59 hours. The program of study for the Ph.D. candidate is formulated by his Advisory Committee.

A candidate for the M.B.A. in Marketing chooses an adviser from the Marketing

Department and designates marketing as his area of concentration. A candidate for the Ph.D. in Business Administration with an area of concentration in Marketing selects his adviser from the Marketing Department and writes his dissertation in the marketing area.

The Department of Marketing has from five to seven assistant instructorships available for M.B.A. and Ph.D. candidates in Business Administration. Stipends vary but range from \$1,500 for part-time M.B.A. candidates to \$3,900 for half-time appointments.

In addition to information given under "Business Administration," students should refer to the Regulations of the Graduate School as they apply to the Master's and Doctor's degrees. For information not given in this bulletin, please write to the Department chairman.

MATHEMATICS

W. ROY UTZ, Ph.D., University of Virginia. Chairman; Prof.

JOSEPH L. ZEMMER, Ph.D., University of Wisconsin. Director of Graduate Studies; Prof.

KEITH W. SCHRADER, Ph.D., University of Nebraska. Assoc. Chairman; Assoc. Prof.

LEONARD M. BLUMENTHAL, Ph.D., The Johns Hopkins University. Luther Marion Defoe Distinguished Prof. of Mathematics; Prof.

PAUL B. BURCHAM, Ph.D., Northwestern University. Executive Officer of Mathematical Sciences; Prof.

DAVID A. HANSON, Ph.D., Indiana University. Prof.

WALTER LEIGHTON, Ph.D., Harvard University. Chairman of Mathematical Sciences; Prof.

JOHN K. BEEM, Ph.D., University of Southern California. Assoc. Prof.

JAMES A. HUCKABA, Ph.D., University of Iowa. Assoc. Prof.

PING FUN LAM, Ph.D., Yale University. Assoc. Prof.

L. JEROME LANGE, Ph.D., University of Colorado. Assoc. Prof.

CLINTON M. PETTY, Ph.D., University of Southern California. Assoc. Prof.

DAVID J. RODABAUGH, Ph.D., Illinois Institute of Technology. Assoc. Prof.

ERNEST L. ROETMAN, Ph.D., Oregon State University. Assoc. Prof.

F. DENNIS SENTILLES, JR., Ph.D., Louisiana State University. Assoc. Prof.

DONALD C. TAYLOR, Ph.D., University of Kentucky. Assoc. Prof.

CALVIN D. AHLBRANDT, Ph.D., University of Oklahoma. Asst. Prof.

BILLY D. ARENDT, Ph.D., University of Iowa. Asst. Prof.

STEPHEN R. BERNFELD, Ph.D., University of Maryland. Asst. Prof.

DAVID H. CARLSON, Ph.D., Case Western Reserve University. Asst. Prof.

ROBERT P. CARMIGNANI, Ph.D., Rice University. Asst. Prof.

RICHARD M. CROWNOVER, Ph.D., Louisiana State University. Asst. Prof.

MARY L. CUMMINGS, M.A., University of Illinois. Asst. Prof.

RICHARD J. FLEMING, Ph.D., Florida State University. Asst. Prof.

ROBERT B. GRAFTON, Ph.D., Brown University. Asst. Prof.

EULINE GREEN, Ph.D., Purdue University. Asst. Prof.

DIX PETTEY, Ph.D., University of Utah. Asst. Prof.

KEITH R. PIERCE, Ph.D., University of Wisconsin. Asst. Prof.

JACK P. SANDERS, Ph.D., University of Virginia. Asst. Prof.

The Department of Mathematics offers graduate work leading to the degrees Master of Arts, Master of Science for Teachers, Master of Science in Applied Mathematics, and Doctor of Philosophy.

Before being accepted as a candidate for an advanced degree in Mathematics, an applicant must first be admitted to the Graduate School. His undergraduate mathematics courses and grades will then be evaluated by the Department. While a bachelor's degree from an accredited institution is required, the undergraduate major need not be mathematics, as long as the applicant has had sufficient mathematics training to prepare him for graduate work. This means two mathematics courses beyond calculus, preferably advanced calculus and modern algebra.

There are currently about 90 graduate students in the Department, of whom 25 are post-Master's students. Many of the graduate students are supported by teaching assistantships in the Department, and there are several fellowships available to qualified students.

MASTER OF ARTS

The requirements for the M.A. degree include the satisfactory completion of 30 hours of approved course work and a final

oral examination. Normally the 30 hours are all in mathematics, and 18 hours of work in courses numbered 400 or above (with at least one course from each of the areas of analysis, algebra, and geometry-topology) must be included. There is no thesis or language requirement. The final examination will test the mastery of the fundamental concepts of the basic areas of mathematics.

MASTER OF SCIENCE FOR TEACHERS

This degree is designed primarily for those whose major interest is in the teaching of mathematics at the secondary school level. It is designed to give a student a broad background in courses at the advanced-undergraduate—beginning-graduate level, but does not require the depth of study needed in the M.A. program. Courses in other fields such as Statistics and Computer Science may be included as part of the program. Only students who are certified to teach high school mathematics will be admitted to candidacy for this degree. Requirements for the degree include 30 hours of course work of which at least one course must be numbered 400 or above. At least two courses in each of the fields of Algebra, Analysis, and Geometry (including Topology) must be included in the program. Comprehensive written and oral examinations will be given near the end of the program.

MASTER OF SCIENCE IN APPLIED MATHEMATICS

The program for this degree is designed to give students training in those areas of mathematics which are frequently used in applications. In addition to meeting the general requirements of the Graduate School for a Master's degree, the student must satisfy the following departmental requirements: specific courses in real variables, complex variables, and partial differential equations (Math 404, 413, and 408, respectively) are required. It is also expected that the student will have completed at least one course in each of the areas of linear algebra, numerical analysis, differential equations (beyond Math 301) and mathematical statistics or probability.

At least four 400-level courses must be taken in the Department of Mathematics and at least three hours of graduate credit must be earned in approved courses outside this Department. The student is required to pass a written examination on the foundations of real and complex analysis, linear algebra, and ordinary differential equations. (An additional oral examination may be required in some circumstances.) Exceptions to the above requirements may be obtained by consent of the student's adviser and the Director of Graduate Studies.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree in Mathematics is a professional research degree designed to prepare students for various advanced professional careers, including college teaching and research.

Before formally becoming a candidate for the Ph.D. degree, a student must have training equivalent to that required for a Master's degree and must pass a qualifying examination covering analysis, algebra, geometry, and topology at the level required for the M.A. Students with Master's degrees from other institutions are often permitted to transfer this work as a third of the residence requirement for the Ph.D., and should expect to take the qualifying examination within about one year after beginning their work here. In addition, the candidate must pass two foreign language reading examinations, complete a course of study approved by his advisory committee, and pass a comprehensive examination.

This Department has directed Ph.D. work for over 65 years. The active areas of research interest of the current members of the staff are: algebraic geometry, applied mathematics, associative rings, Banach algebras, commutative algebra, complex function theory, continued fractions, convex sets, differential equations, differential geometry, distance geometry, ergodic theory, functional analysis, group theory, measure theory, non-associative algebra, numerical analysis, partial differential equations, projective planes, semigroups, topological algebra, topological dynamics, topological vector spaces, topology.

MECHANICAL AND AEROSPACE ENGINEERING

PAUL W. BRAISTED, Ph.D., Stanford University.
Chairman; Prof.

CARL M. SNEED, Ph.D., University of Michigan.
Assoc. Chairman; Assoc. Prof.

RICHARD C. WARDER, JR., Ph.D., Northwestern University. Director of Graduate Studies;
Assoc. Prof.

MILO M. BOLSTAD, Ph.D., University of Minnesota. Prof.

HUBER O. CROFT, M.S., University of Illinois.
Dean Emeritus; Prof.

ALFRED S. GASKELL, M.S., Iowa State University.
Prof.

JOHN C. LYSEN, Ph.D., Iowa State University.
Prof.

JOHN B. MILES, Ph.D., University of Illinois.
Prof.

JACK W. MORGAN, Ed.D., Kansas State College.
Asst. Dean, College of Engineering; Prof.

ORAN A. PRINGLE, Ph.D., University of Wisconsin. Prof.

LENNOX N. WILSON, Ph.D., University of Toronto. Prof.

WILLIAM L. CARSON, Ph.D., University of Iowa.
Assoc. Prof.

DONALD L. CREIGHTON, Ph.D., University of Arizona. Assoc. Prof.

DONALD L. GIBSON, Ph.D., Vanderbilt University. Assoc. Prof.

DAVID A. HANSEN, Ph.D., Iowa State University. Assoc. Prof.

FRANKLIN D. HARRIS, Ph.D., University of Arkansas. Assoc. Prof.

JOHN LOVE, JR., Ph.D., Oklahoma State University. Assoc. Prof.

CHARLES N. MCKINNON, JR., Ph.D., University of Missouri-Columbia. Assoc. Prof.

GORDON L. MOORE, Ph.D., University of Florida. Assoc. Prof.

GEORGE H. STICKNEY, Ph.D., University of Michigan. Assoc. Prof.

DAVID E. WOLLERSHEIM, Ph.D., University of Illinois. Assoc. Prof.

ROSS D. YOUNG, M.S., Iowa State University.
Assoc. Prof.

GAYLORD H. BUNCH, M.S., University of Missouri-Columbia. Asst. Prof.

ROGER C. DUFFIELD, Ph.D., University of Kansas. Asst. Prof.

CHARLES A. STEVENS, M.S., Worcester Polytechnic Institute. Asst. Prof.

FRANK R. SWENSON, Ph.D., University of Iowa.
Asst. Prof.

DARROL H. TIMMONS, Ph.D., Kansas State University. Asst. Prof.

The Department of Mechanical and Aerospace Engineering offers advanced

study leading to the degrees of Master of Science and Doctor of Philosophy.

The graduate programs in the Department are planned to prepare students for advanced professional careers in engineering. Considerable latitude is allowed and encouraged in the details of the programs taken by different students. This is in recognition of the broad nature of the field of Mechanical and Aerospace Engineering, as well as the fact that students will be preparing themselves for different types of employment, such as in teaching, industry or government.

Some areas of concentration a student may pursue are gas dynamics, heat transfer, direct energy conversion, engineering mechanics, design, automatic controls, material science, bio-medical engineering, thermodynamics, and refrigeration and cryogenics.

The Department has a number of special laboratory areas which are continually being expanded and improved. Included are laboratories for material science, heat transfer, fluid dynamics, automatic controls, systems dynamics, X-ray diffractometry, and micro-wave plasma diagnostics.

In addition to the modern instrumentation and equipment normally found in well-equipped mechanical and aerospace engineering laboratories, the Department has such special items as a sub-sonic and super-sonic wind tunnel; a water table; an ultra-high vacuum system; three dynamic shake tables, including a 3,500 vector-pound electrodynamic shaker; a GE X-ray diffractometer; a shock tube; a 32-kilogauss electro-magnet; a Kerr cell optical shutter; and an optical spectrometer. Graduate students have convenient access to an IBM 360, Model 50 digital computer and an SEL 840-A hybrid computer operated by the College of Engineering. The proximity of the University of Missouri-Columbia School of Medicine offers opportunity for inter-disciplinary projects in the rapidly developing field of bio-engineering.

The Department currently has support for about two-thirds of its graduate students in the form of traineeships, fellowships, and research and teaching assistantships. Consideration of applications for financial support starts on March 1 of each year. Application forms and further in-

formation about the Department can be obtained by writing the Director of Graduate Studies, Department of Mechanical and Aerospace Engineering.

MASTER OF SCIENCE

The Master of Science Degree in Mechanical and Aerospace Engineering is open to students with a B.S. degree in the same, or closely related field.

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. Lower GPA's require special action and substantiation, such as strong letters of recommendation and a good score on the G.R.E. or other recognized examination. The student's program of study is developed by the student and his adviser, subject to approval by the Departmental Graduate Committee and the Department Chairman.

The minimum degree requirement is 30 semester hours which must include a special problem (MAE 400) or a thesis project (MAE 490). This 30 hours shall include 3 to 6 hours of MAE 400 but not more than 6 hours total of MAE 300 (Problems) and 400 for programs terminating in a report. Alternatively, programs directed towards a thesis shall include 6 to 9 hours of MAE 490 with not over 9 hours total of MAE 300, 400, and 490. A necessary step with either a thesis or a report is having it read and approved by designated faculty members and placed on file in the departmental records. The final step in completing the degree requirements is the successful completion of the M.S. final examination, administered by a faculty committee.

Graduate course work taken at other accredited institutions may be transferred up to a maximum of 6 hours. Courses in the 300 series, if not required for the undergraduate degree in Mechanical and Aerospace Engineering, may be used as part of the graduate program. Courses in the 200 series and not in the MAE Department may also be part of the program. Each program must have at least 6 hours credit outside of the MAE Department and at least 15 hours of 400-level credit.

DOCTOR OF PHILOSOPHY DEGREE

Applicants wishing to enter the Ph.D. program will be closely and individually scrutinized. The minimum admission requirements include (1) a strong record on the M.S. program and (2) three letters of recommendation, one being from the applicant's M.S. adviser if possible. Additionally, all applicants will be strongly urged to take the G.R.E. examination.

The usual purpose of a Ph.D. program is to prepare a person for a career in research or in teaching. The program is oriented towards research culminating in a dissertation suitable for publication.

In addition to course work in engineering, it is expected that the student's program will include additional mathematics and basic science courses. Proficiency in reading one pertinent foreign language is currently required for the Ph.D. degree. German or French is customary; however, an appropriate substitution can be made for good cause. Alternatively, a special research technique or a collateral field can be substituted for the language.

Three years of work beyond the bachelor's degree is a minimum requirement. These three years must include at least two semesters in residence with a graduate registration of at least twelve credit hours per semester. The three-year requirement beyond the bachelor's degree may be met by completing the equivalent of four semesters of full-time work beyond the Master's degree.

The Ph.D. candidate works out his program of study and research under the immediate supervision of his adviser and in close cooperation with his advisory committee, which is appointed by the dean of the Graduate School upon the adviser's recommendation.

A Ph.D. qualifying examination is given soon after the student begins his doctoral study. It is administered by a five-man committee selected by the student's adviser and consists of both written and oral questions. In cases when previously arranged, the M.S. final examination can be administered so that it will also serve as the Ph.D. qualifying examination. Successful completion of this examination is a prerequisite to formal acceptance into the Ph.D. program.

A comprehensive examination is given after all course work and language requirements have been satisfied. Upon completion of the program of study and research, a final examination is administered which is essentially a defense of the dissertation.

MICROBIOLOGY

FRANK B. ENGLE, JR., Ph.D., University of Pennsylvania. Chairman; Director of Graduate Studies; Prof.

JAMES T. BARRETT, Ph.D., University of Iowa. Prof.

HERBERT S. GOLDBERG, Ph.D., Ohio State University. Asst. Dean of the School of Medicine; Prof.

JOHN M. MCKENNA, Ph.D., Lehigh University. Investigator in Space Science Research Center; Prof.

DAVID J. HENTGES, Ph.D., Loyola University. Assoc. Prof.

JOSEPH T. PARISI, Ph.D., Ohio State University. Assoc. Prof.

RONALD F. SPROUSE, Ph.D., University of Oklahoma. Assoc. Prof. of Veterinary Microbiology and Microbiology

REUEL R. HOOK, JR., Ph.D., University of West Virginia. Microbiologist at Sinclair Comparative Medicine Research Farm; Asst. Prof.

HAMMOND G. RIGGS, JR., Ph.D., University of Texas. Asst. Prof.

DAVID D. SCHERR, Ph.D., University of Iowa. Asst. Prof. of Orthopedic Surgery; Asst. Prof. of Microbiology

ELMER R. SPURRIER, Ph.D., University of North Carolina. Visiting Lecturer

The Department of Microbiology offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy. The M.S. degree is designed for students who have an undergraduate degree in biological or physical science; it combines depth in microbiology with breadth in closely allied sciences. The Master's program requires about two years advanced study culminating in a research thesis under the supervision of the student's adviser. The Ph.D. degree is offered to students who have reached, after long study, a high attainment in some special branch of learning and have given the clearest evidence of contribution, as approved by competent judges. The Ph.D. program normally requires three years beyond the Master's degree.

Graduate programs in microbiology are designed to prepare students for advanced

professional careers in universities and colleges, research institutes, public health and hospital laboratories, industrial research, and production institutes. The educational philosophy of the department views microbiology as a field which is changing rapidly because of the advent of new techniques designed to obtain biological information at the subcellular or molecular level. Accordingly, graduate programs in microbiology include coursework in biochemistry, chemistry, genetics, and statistics.

Special facilities for microbiology study and research include: infra-red, ultraviolet, and visible light spectrophotometry; ultraviolet, darkfield phase, and electron microscopy; high speed preparative and analytical ultracentrifugation, lyophilization equipment; column chromatography; paper, disc, starch and gel electrophoresis; special equipment for anaerobic studies; and facilities for germ-free animal experimentation.

The distinct areas of concentration a student may pursue are antibiotics, antiseptics disinfection and sterilization, ecology, immunology, microbial genetics, mycology, parasitology, microbial physiology, and virology.

Many students admitted to the doctoral program in Microbiology are awarded teaching or research assistantships. Under the guidance of faculty members, teaching assistants are given practical experience in planning, organizing, teaching, laboratory preparation, and evaluating matter in microbiology. Similarly, research assistants work with faculty members who are conducting research projects in microbiology and related fields. In this way, research assistants obtain practical experience in the planning of research proposals, the collection of research data, and the writing of research reports.

THE M.S. DEGREE PROGRAM

Entrance requirements for the M.S. program are a degree from an acceptable college or university, with courses in the following: biology (botany or zoology, plus at least one advanced course); chemistry (qualitative and organic); physics (one year); and mathematics (college algebra, analytical geometry, or trigonometry). The GRE is required.

The minimum course requirements for

completing the degree are 30 hours of graduate study, including medical microbiology (8 hours), seminar (4 hours), research (8 hours), and microbiology (7 hours). No more than 12 hours' credit is allowed for research, special problems, special investigations, and research readings. At least 16 of the 30 hours must be in courses numbered 400 or above.

In addition, a student must complete original research in preparation of a thesis and pass an oral examination in its defense and covering the course work. A student should also refer to the regulations given in this bulletin regarding Master's degrees.

THE Ph.D. PROGRAM

To be considered for candidacy in the Ph.D. program, an applicant must show satisfactory performance on a qualifying examination. A UMC Master's examination may be accepted in lieu of the Ph.D. qualifying examination. Candidacy of a student who has earned the Master's degree elsewhere shall be determined by satisfactory performance on the Ph.D. Qualifying Examination, written and/or oral, administered by the faculty.

This program normally requires three years beyond the Master's degree and consists of (1) a course of study, (2) practical experience in teaching and research, (3) examination over accumulated knowledge in a major and at least one minor field and one foreign language, and (4) demonstration of research and writing ability by completing a doctoral dissertation on an approved research problem.

Under the guidance of an advisory committee, a course of study is individually designed to fit each student's academic background, experience, and objectives.

Minor fields may include biochemistry, chemistry, genetics, and statistics, or other areas. The minor field(s) provides breadth and balance in each student's program and enhances the student's research abilities. First and second minors may be so designated; a minor field shall comprise 15 semester hours of work carrying graduate credit in a single department.

A final examination will cover chiefly the dissertation. Refer also to the regulations governing Ph.D. degrees elsewhere in this bulletin.

MUSIC

CHARLES L. EMMONS, M.E., West Texas State University. Chairman; Prof.
RUTH MELCHER ALLEN, M.A., University of Missouri-Columbia. Prof.
RICHARD L. HILLS, Ph.D., University of Iowa. Prof.
THOMAS L. MILLS, M.M., University of Illinois. Prof.
ANDREW C. MINOR, Ph.D., University of Michigan. Assoc. Dean of the Graduate School; Prof.
RICHARD L. MORRIS, M.M., Indiana University. Prof.
CARLETON B. SPOTTS, M.M., Manhattan School of Music. Prof.
ALEX H. ZIMMERMAN, Ph.D., Columbia University. Director of Graduate Studies; Prof.
JAMES M. BURK, D.M.Ed., University of Oklahoma. Assoc. Prof.
GEORGE B. DEFOE, M.A., Columbia Teachers College. Assoc. Prof.
WILLIAM T. MCKENNEY, Ph.D., University of Rochester. Assoc. Prof.
HARRY S. MORRISON, JR., M.F.A., University of Iowa. Assoc. Prof.
CHARLES NICK, Ph.D., Indiana University. Assoc. Prof.
PERRY G. PARRIGIN, M.M., Indiana University. Assoc. Prof.
ALEXANDER L. PICKARD, JR., M.A., University of Iowa. Assoc. Prof.
BARBARA A. WOOD, M.A., University of Missouri-Columbia. Assoc. Prof.
AVENEL H. BAILEY, M.A., University of Missouri-Columbia. Asst. Prof.
MARION P. BARNUM, M.F.A., University of Iowa. Asst. Prof.
BONNIE A. BROMBERG, M.M., Florida State University. Asst. Prof.
JOHN E. CHEETHAM, D.M.A., University of Washington. Asst. Prof.
MERRILY D. CULWELL, M.M., University of Oklahoma. Asst. Prof.
ULRICH DANNEMANN, Certificate, University of Rome. Asst. Prof.
EUGENE GRATOVICH, D.M.A., Boston University. Asst. Prof.
HELEN K. HARRISON, M.A., State University of Iowa. Asst. Prof.
RAYMOND C. HERBERT, M.M., Eastman School of Music. Asst. Prof.
IRA C. POWELL, D.M.Ed., University of Oklahoma. Asst. Prof.
CHARLES H. SHERMAN, Ph.D., University of Michigan. Asst. Prof.
DAVID W. SLOAN, D.M.A., University of Texas. Asst. Prof.

The Department of Music offers graduate programs leading to the degrees Mas-

ter of Music in Theory and in the applied areas; Master of Arts in Music History, Theory, Composition, or Education (with a major in Music Education); Master of Education with a major in Music Education. For Education information, see the department's listing in the bulletin.

At the University of Missouri-Columbia, a student of music has unusual opportunity to participate in varied performing organizations. The music section of the Fine Arts Building contains a recital hall, classroom and studio—all air-conditioned and suitably equipped.

A series of recitals are given by students, faculty, and visiting artists; several concerts are given during the year by the University Orchestra, Concert Band, Collegium Musicum, Rollins Graduate String Quartet, and the Esterhazy Quartet.

The Art, Archaeology and Music Library is one of seven subject-oriented library divisions within the UMC Library. The fine arts holdings here number 25,000. The department maintains an electric keyboard laboratory for class piano and has access to a Listening Laboratory for music history and theory courses.

A student should write the Department for its bulletin in which the precise course requirements for the various sequences are given. At the same time, the student may request information for assistantships and other financial aids available.

ENTRANCE REQUIREMENTS

All graduate students intending to pursue a program which requires the study of theory courses must take the Graduate Entrance Examination in Theory. Students failing to meet the minimum standards in aural perception, or stylistic writing and analysis, will be required to satisfactorily complete the respective review course (Music 107 and/or 108). The entrance examination will be given at 8:00 a.m. on the first day of registration in August or June in Room 146, Fine Arts Building.

THE MASTER OF MUSIC DEGREE

The applied areas of performance are piano, organ, strings, voice, and wind instruments. A candidate must have a B.M. in the same area or its equivalent. If a



student did not present a senior recital for his B.M., he must present such a program prior to his Graduate Recital. Other prerequisites for admission are the performance ability of graduate level as determined by an audition for a committee in the applied area and a foreign language requirement of 13-20 hours, depending on the major.

To satisfy the requirements for the M.M. degree in one of the applied areas, a student must complete 32 hours of graduate work, with a minimum of 16 hours at the 400 level; admission to 400-level courses is determined by audition. In all areas, six hours of music history and six of music theory at the 300 level are required. Graduate-level courses in the area, repertory and electives, complete the course requirements. The Graduate Recital will have a faculty hearing in advance of the public performance. Piano majors present, in addition to the Graduate Recital, a memorized performance of a concerto with orchestra or second piano.

The prerequisites for the Master of Music degree in Theory include: (1) admission to Graduate School, (2) Bachelor's degree in music, (3) evidence of study and satisfactory completion of 18 hours in basic theory courses (including 2 hours of form and analysis), 4 hours of sixteenth- or eighteenth-century counterpoint, 4 hours of orchestration, 2 hours theory elective, (4) 4 hours of music history, (5) 16 hours or the equivalent of undergraduate applied music.

All candidates must file a formal application with the theory staff for admission to the program. Other requirements include a thesis, final oral examination, and a proficiency audition in sight singing and keyboard harmony.

The program of study consists of 22 hours of advanced courses in theory (including a thesis, 4 to 6 hours), 5 to 6 hours of music history, and 5 to 6 hours of applied music. A minimum of 33 hours must be completed by all students.

THE MASTER OF ARTS DEGREE

Prerequisites for the M.A. in Music History are admission to the Graduate School and two years of piano; that is, sufficient proficiency in technique and sight reading to be of use as a tool for investigation. In addition, he must have taken 16 hours in harmony, ear-training, and sight singing, four hours in 16th century counterpoint and four in form and analysis, as well as eight hours of music history.

To complete requirements for the degree, the music history major may include eight hours of upperclass work in applied music courses, numbered 300 or above, in partial satisfaction of the requirements for the degree. Music history courses 321, 322, 323, 324, or 325 may be included for graduate credit if not used to satisfy prerequisites for admission. In addition to the course requirements of 14-20 hours of music history and an outside course, a formal thesis on some phase of music history is required. This may count as graduate credit of up to eight hours in Music 490. In lieu of a formal thesis, a public recital may be substituted, subject to a pre-recital faculty hearing. In addition to the recital, each non-thesis major will elect Music 400 for eight hours, which will include a survey of the literature in his applied field. As a part of this survey, the student will write three extended term papers.

The prerequisites for the M.A. in Theory are the same as those for the M.M. in Theory. The requirements for the program of study include: (1) eighteen to twenty-two hours of advanced courses in theory (including a thesis, four to six hours), (2) 5 to 6 hours of music history, (3) 5 to 6 hours in areas other than music, (4) 2 hours in an applied area (optional). A minimum of 32 hours is essential for the above degree.

For information regarding the prerequisites and program of study for the M.A. degree in Composition, please write to the Chairman of the Music Department.

NURSING

RUBY M. POTTER, Ed.D., University of Colorado.
Assoc. Dean, School of Medicine, In Charge of
School of Nursing; Prof.

ALICE R. MAJOR, Ed.D., Teachers College, Col-
umbia University. Asst. to Dean; Director of
Graduate Studies; Assoc. Prof.

BETTY CRIM, M.Ed., University of Missouri-
Columbia. Director, Medical-Surgical Nursing;
Assoc. Prof.

GRACE R. FOWLER, M.A., Case Western Reserve.
Director Graduate Psychiatric Nursing; Prof.

PEGGY JEAN DISMUKE, M.S.N., Washington Uni-
versity. Asst. Prof.

JEAN LAGERSTROM, M.S.N., Washington Uni-
versity. Asst. Prof.

INGEBORG GROSSER MAUKSCH, Ph.D., University
of Chicago. Assoc. Prof.

MARLENE ROSE MAXWELL, M.S.N., Washington
University. Instructor

ANN S. NEWMAN, M.S.N., Washington Univer-
sity. Instructor

MARY M. SPELMAN, Ed.D., University of Florida.
Assoc. Prof.

At present the School of Nursing offers the degree Master of Science with clinical concentrations in Medical-Surgical Nursing, Psychiatric Nursing of Adults, and Psychiatric Nursing of Children, with functional specialization in either teaching or administration (supervision) of patient care. Additional clinical concentrations are planned in the future.

The program of study, which is NLN-accredited, requires a minimum of four semesters for completion. It is characterized by a common core of courses in the clinical and research areas and a prescribed constellation of courses focused on the particular functional area chosen. In addition, the program includes a thesis, electives and a course in special readings. Its purpose is to develop (1) expert skill in giving nursing care to patients in the area of specialization chosen, (2) beginning proficiency in the competencies desirable for the functional specialization chosen, and (3) beginning skill in conducting research and appraising the research of others.

The program with functional preparation in supervision prepares the graduate (1) to supervise the nursing care of patients in one or more divisions of a general or specialized hospital or in a community agency, (2) to coordinate the ac-

tivities of others in effective utilization of education and skill in caring for patients, (3) to give expert nursing care, and (4) to give leadership in improving the nursing care patients receive.

The program with functional preparation in teaching prepares the graduate (1) to teach nursing in either or both the classroom and the clinical field and to do this in either a Baccalaureate program or an Associate degree program, and (2) to give expert nursing care in the area of specialization chosen and to provide leadership to others in doing so.

The competencies desirable in expert practitioners of Medical-Surgical Nursing are seen as the ability (1) to design and deliver to patients with medical-surgical conditions, nursing care that is comprehensive in scope and continuous in a variety of settings; (2) to select or derive approaches to nursing practice based on analysis and synthesis of knowledge gained from the theoretical components of nursing and its basic scientific foundations; and (3) to achieve intra- and inter-professional relationships that facilitate the delivery of high quality nursing care.

The clinical concentration in Psychiatric Nursing prepares the graduate to: (a) integrate a comprehensive understanding of various theories of the sociopsychodynamics of human behavior and personality development in relation to individuals—in both health and illness—trying to meet their needs in the social milieu in which they find themselves; (b) synthesize understanding of self-motivation, needs, desires, potentials and abilities as an aid to thinking logically, critically, and creatively in various psychiatric nursing situations; (c) work therapeutically with individuals and groups toward the fulfillment of needs and the development of greater self realization; (d) achieve a comprehensive understanding of the psychosocial elements of the total patient community and proficiency in analyzing nursing environments and implementing change to enhance the culmination of the therapeutic potential; and (e) utilize beginning research skills in designing and conducting an independent study in Psychiatric Nursing.

The clinical concentration in Psychiatric Nursing of children prepares the graduate

as above, as well as to distinguish between healthy and unhealthy development, to assess the developmental needs of the emotionally ill child, and to mobilize individual strengths for the resolution of unmet needs.

All students in the School of Nursing have access to the library of the Medical Center with its large collection of medical and nursing books, journals, tapes, etc. The School's location in the Medical Sciences Building of the UMC Medical Center provides convenience for the Medical-Surgical nursing students as they obtain learning experiences in the UMC Hospital, its outpatient department, the Mid-Missouri Mental Health Center, and the rehabilitation unit housed in McHaney Hall. In addition, existing faculty relationships provide the potential for opportunities for students to gain learning experiences in other hospitals and health agencies in and about the city of Columbia as they become necessary or desirable.

A limited number of traineeships, fellowships, scholarships, and assistantships are available to graduate students who qualify. Additional information regarding financial assistance and about additions to the expanding programs may be obtained from the Director of Graduate Studies, School of Nursing, UMC.

M. S. DEGREE REQUIREMENTS

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. However, to be admitted to the Master's Nursing Program, a student must (1) have graduated from a National League for Nursing-accredited baccalaureate nursing program; (2) have an undergraduate GPA of 2.75 (on a 4.0 scale) or higher, with consideration being given to other factors; and (3) show acceptable performance on the GRE, Part I. Foreign students must take the TOEFL.

To satisfy requirements for the M.S., a student must (1) complete one of the approved Master's programs with a cumulative GPA of 3.0 ($A=4$); (2) pass a comprehensive written examination covering

the student's graduate course work; (3) complete the written report of, and orally defend a thesis; and (4) comply with residence, time limitations, and other matters as specified in this bulletin.

The approved programs involve completion of 46 semester hours of graduate course work, including at least 30 hours numbered 400 or higher. Of the 46 hours, at least 19 must be in the School of Nursing and at least 13 must be in a School or department other than Nursing.

The clinical sequence requires 18 hours in the concentration elected; the functional sequence, 11 to 12. The research sequence comprises 8 to 11 hours inclusive of a thesis. Both the clinical and the functional sequences include practicum. There are 6 to 9 hours of electives.

PATHOLOGY

FRED V. LUCAS, M.D., University of Rochester. Chairman; Prof.

ARLENE P. MARTIN, Ph.D., University of Rochester. Director of Graduate Studies; Assoc. Prof.

DONALD A. SENHAUSER, M.D., College of Physicians & Surgeons. Prof.

DONALD A. B. LINDBERG, M.D., College of Physicians & Surgeons. Prof.

JAMES T. PACKER, M.D., Temple University School of Medicine. Assoc. Prof.

HUBERT J. VAN PEENEN, M.D., University of California School of Medicine. Assoc. Prof.

MARIE L. VORBECK, Ph.D., Cornell University. Assoc. Prof.

JAMES ESTERLY, University of Chicago. Asst. Prof.

HOWARD C. HOPPS, M.D., Ph.D., University of Chicago. Prof.

The Department of Pathology of the School of Medicine offers graduate work leading to the degree of Master of Science in Pathology. The Department cooperates with the Department of Plant Pathology of the College of Agriculture and with the Department of Veterinary Pathology of the School of Veterinary Medicine in offering a new area Ph.D. program in Pathology. Information on this Ph.D. program is presented in the section on Area Programs in this bulletin.

Research in pathology is readily accomplished through the availability of standard and special use equipment in the research laboratories. Faculty and staff members provide guidance, as well as practical

supervision in the conduct of clinical and experimental research. This M.S. degree is designed to prepare students for clinical and/or research careers in general hospitals or commercial laboratories. The degree is also considered preparatory to the Ph.D. degree which may lead to careers in teaching and independent research.

Financial assistance is available to students in the form of assistantships. For information and application forms, write to the Chairman, Pathology Department, UMC Medical Center.

DEGREE REQUIREMENTS

Admission to candidacy in the master's program is limited to those who hold a baccalaureate degree in one of the biological sciences from an accredited college or university. GRE scores should be submitted on the general aptitude section of the examination.

Requirements for the degree include: (1) a minimum of 30 semester hours, with 15 or more hours at the 400 level; (2) maintenance of a *B* or better average in graduate course work; (3) no more than 12 hours of research, problems, or special investigations culminating in a dissertation; and (4) satisfactory performance on a final examination in which the candidate is expected to demonstrate his knowledge of clinical and research techniques as well as defend his dissertation.

Students are advised by faculty members in the preparation of a program of study. Required courses are blended with those of special interest to the individual student in order to complement the student's aca-

demic background and career objectives. In some cases, additional course work may be recommended to strengthen the candidate's knowledge of pathology.

The student must also meet the general requirements of the Graduate School listed elsewhere in this bulletin.

PHARMACOLOGY

BERTIS A. WESTFALL, Ph.D., University of Missouri-Columbia. Chairman; Prof.

LESLIE EISENBRANDT, Ph.D., Rutgers University. Prof.

ALEXANDER D. KENNY, Ph.D., Institutum Divi Thomae. Prof.

AMEDEO S. MARRAZZI, M.D., New York University. Prof.

ROBERT L. RUSSELL, Ph.D., University of Missouri-Columbia. Director of Graduate Studies; Prof.

WALTER D. WOSILAIT, Ph.D., Johns Hopkins University. Prof.

KEITH H. BYINGTON, Ph.D., University of South Dakota. Asst. Prof.

WILLIAM H. CLINE, JR., Ph.D., University of West Virginia. Asst. Prof.

LEONARD R. FORTE, Ph.D., Vanderbilt University. Asst. Prof.

CHARLES H. SHORT, Ph.D., D.V.M., University of Missouri-Columbia. Asst. Prof.

GARRETH THOMAS, M.S., Iowa University. Asst. Prof.

The Department of Pharmacology offers graduate programs leading to the degree of Master of Science and Doctor of Philosophy in Pharmacology. The Master of Science degree in Pharmacology is a four-semester program designed primarily for those individuals who need a solid background in biochemistry and physiology plus fundamental courses in pharmacology in preparation for the Ph.D. program. As pharmacology is not taught in most undergraduate colleges due to the required background of mathematics, physics, physiology, and biochemistry, the core of knowledge and understanding at the Master's degree level is usually not sufficient for the most successful career in pharmacology. Hence, the Master of Science program is used as one major step toward the Ph.D. program.

Graduate programs in Pharmacology are designed to prepare students for academic



teaching and research, research career positions in the government, or industrial research in pharmacology. Students may select from a variety of areas in research in this Department. Among them are studies, including the absorption, biotransformation, distribution and excretion of drugs; compounds affecting the autonomic system; mechanisms of action of anticoagulant drugs; metabolism of calcium especially as it relates to the hormone thyrocalcitonin; cancer research; pharmacodynamics of hypnotics, sedatives, depressants, anti-convulsants and various other drugs which alter behavior; and the pharmacology of some local plant extractives. The major emphasis of the Department is biochemical comparative pharmacology.

Our cooperative program with the School of Veterinary Medicine makes possible a well-equipped comparative pharmacology laboratory on a nearby research farm where the effects of drugs on animals such as horses, goats, sheep, swine, cats, rabbits, rats and mice are being studied. This unique facility enables us to study drug absorption, distribution, metabolism and elimination of compounds. Likewise, the Space Sciences Research Laboratory provides excellent facilities for the study of bone metabolism. Furthermore, our close tie with the Missouri Institute of Psychiatry in St. Louis enables graduate students to conduct research in neuropharmacology. Our location in Columbia enables us to enrich our program through meaningful contribution by the colleges of Arts and Science, Agriculture, Veterinary Medicine and Medicine. The cooperative research atmosphere on this campus is genuine and the ability of our staff and students to work across departmental lines makes this institution unique as an educational center for training in pharmacology.

Fellowships, scholarships, and teaching and research assistantships are available to qualified pharmacology graduate students within the limits of our resources. Applications should be submitted by March 1. Additional information can be obtained from the Director of Graduate Studies, Department of Pharmacology, M523 Medical Sciences Building, UMC, Columbia, Missouri 65201.

DEGREE PROGRAMS

Admission to the Master of Science program is open to students who have a good background in biology and chemistry with some understanding of mathematics and physics. Deficiencies may be remedied during the graduate program. A bachelor's degree in either chemistry, biology, or pharmacy from an accepted accredited college is required. Selection of students is based upon a combination of the following criteria: a 3.0 or higher overall grade point average (some exceptions) in undergraduate work ($A=4.0$) with consideration being given to a variety of other criteria serving as predictors of probable success in graduate study. All students are required to take the Graduate Record Examination and perform upon it acceptably.

To satisfy requirements for the M.S. degree, a student must complete the professional program of study of 30-48 hours with an average grade of *B* or better, and pass an oral comprehensive examination over an acceptable Master's dissertation. Additionally, he must comply with other regulations governing Master's degrees.

The Doctoral Program in Pharmacology normally requires four years beyond the baccalaureate degree. A master's degree is not required in all cases. Entrance directly into the Ph.D. program is possible for students with a solid background and strong potential. If a master's degree is received either at UMC or elsewhere, the program for the Ph.D. degree normally requires three years of additional work.

Acceptance of a student to commence work on the Ph.D. program requires a 3.0 GPA ($A=4.0$) for undergraduate work (occasionally a 2.75 average will be accepted if exceptional strength is shown in selected areas) and superior performance on the GRE. A potential candidate must pass a qualifying examination given by the department and approved by the planning committee. Upon acceptance, a student must complete his program of study, perform research, and gain teaching experience. Although no foreign language or specific correlative skill is required, most of our students are encouraged to take one foreign language and a research technique or collateral field designed to meet the

student's needs. A student will pass a comprehensive examination over the field of pharmacology, present a dissertation, and pass an oral examination over the dissertation.

He should also refer to the regulations governing doctoral degrees elsewhere in this bulletin.

PHILOSOPHY

JOHN H. KULTGEN, JR., Ph.D., University of Chicago. Chairman; Prof.

KHAGENDRA NATH KAR, M.A., University of Rangoon. Director of Graduate Studies; Assoc. Prof.

ARTHUR BERNDTSON, Ph.D., University of Chicago. Prof.

W. DONALD OLIVER, Ph.D., University of Wisconsin. Prof.

WILLIAM B. BONDESON, Ph.D., University of Chicago. Assoc. Prof.

WILLIAM C. WILCOX, Ph.D., Syracuse University. Assoc. Prof.

JOHN C. KELLY, Ph.D., University of Chicago. Asst. Prof.

The Department of Philosophy offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy. Advanced work is offered in the major fields of philosophy: logic, philosophy of science and social science, epistemology, metaphysics, ethics, aesthetics, social and political philosophy, history of western philosophy and Indian philosophy.

The Department emphasizes no school or tradition, but welcomes a variety of methods of interpretation and criticism. Equal attention is devoted to historical and contemporary movements.

The department aims to prepare creative philosophers and superior teachers of philosophy. Graduate students are given full responsibility for underclass sections of Logic, Ethics, and Introduction to Philosophy. Faculty coordinators help graduate students prepare their courses and visit classes to help them improve their teaching techniques. Teaching at least one of the underclass courses is a prerequisite for a Ph.D. The Department offers a graduate seminar in the teaching of philosophy, which the graduate student normally takes for at least one semester.

Original research by graduate students is encouraged and each year several papers

are published in their journal, *Dianoia*. A regular schedule of prominent off-campus philosophers visit the Department yearly for talks and symposia.

University, NDEA, and EDPA fellowships and teaching assistantships are available to qualified graduate students. Applications should be submitted by March 1, each year, for the following fall. Applications for financial assistance and further information may be obtained from the Director of Graduate Studies, Department of Philosophy.

MASTER OF ARTS IN PHILOSOPHY

Presupposed for graduate work in philosophy is the equivalent of six courses required for the B.A. in the department: Logic, Ethics, Ancient Western Philosophy, Early Modern Philosophy, Nineteenth Century Philosophy, and Contemporary Philosophy. Deficiencies may be made up after the student is enrolled at the University of Missouri-Columbia, but only the last two may be taken for graduate credit after acceptance into the graduate program.

Additional admission requirements are a 3.00 grade point average ($A=4.00$) in all undergraduate work for the last four semesters, with a 3.25 average in all philosophy courses, and three letters of recommendation; the GRE Verbal and Quantitative Aptitude Tests are required; the Advanced Test in Philosophy is recommended. The Miller Analogies Test may be substituted for the Graduate Record Examination.

Applicants will be judged not only on the basis of grades and test scores, but also on the general reputation of his undergraduate institution, recommendations, and other evidence of serious intent and intellectual ability. Any unusual circumstances regarding failure to meet the minimum requirements should be called to the attention of the Director of Graduate Studies of the Department.

M.A. degree requirements may be satisfied by either of the following two options: Option A: 30 semester hours of graduate work, of which 15 must be at the 400 level; a thesis, credited at 6 hours of 400-level work, and an oral examination on the

thesis. Option B: 30 semester hours of graduate work in philosophy, of which 15 must be at the 400 level; a Master's Examination. There is no language requirement for the M.A. degree in Philosophy.

At least 80 per cent of the hours submitted for the Master's program must be completed with a grade of *A* or *B*, and at least 75 per cent of *all* graduate hours must be completed with a grade of *A* or *B*.

SPECIAL PROGRAM IN PHILOSOPHY AND THE HUMANITIES

A special two-year program is offered which is designed to prepare teachers of philosophy and the humanities for junior colleges. The program includes: a Master's degree in philosophy (Option A or B), 18 hours of courses in other Humanities departments, and 12 hours of courses in junior College teaching, including a teaching internship. EDPA fellowships are available for candidates in this program.

THE Ph.D. DEGREE

To be considered for admission to candidacy for the Ph.D. program in Philosophy, a student must have an M.A. in philosophy from UMC or another recognized university or college, or the equivalent. For students entering the graduate program for the first time, acceptable performance on the Miller Analogies or the Verbal and Quantitative Aptitude Tests of the GRE is required. The Advanced Test in Philosophy is recommended but not required.

Applicants from other universities are required to have three letters of recommendation sent by those familiar with their prior work in philosophy and are urged to submit other evidence of serious intent and intellectual ability.

Candidacy is established by a qualifying examination. Superior performance on the thesis oral or the Master's Examination in the Department may be accepted as the qualifying examination.

Requirements for the Ph.D. may be fulfilled by satisfying the following:

- three years of residence beyond the B.A., including two 12-hour semesters beyond the M.A.;

- an M.A. from another university, which may be considered as equivalent to one year of residence;
- a related field of study consisting of 12 to 18 hours of appropriate courses in other departments (a suitable undergraduate major may be accepted for the related field, without credit toward residence);
- superior competence in one language, chosen from Greek, Latin, German, French, Spanish, or Italian; i.e., ability to read philosophical texts with facility;
- a comprehensive examination, following completion of residency, covering methodology (logic, philosophy of science, epistemology), metaphysics, values (ethics, aesthetics, social and political philosophy), history of philosophy, and special examinations;
- a dissertation and a final Oral Examination on the dissertation.

PHYSICS

LOUIS V. HOLROYD, Ph.D., University of Notre Dame. Chairman; Prof.

CLIFFORD W. TOMPSON, Ph.D., University of Missouri-Columbia. Director of Graduate Studies; Prof.

HORACE R. DANNER, Ph.D., Pennsylvania State University. Prof.

NEWELL S. GINGRICH, Ph.D., University of Chicago. Prof.

EUGENE B. HENSLEY, Ph.D., University of Missouri-Columbia. Prof.

PAUL W. SCHMIDT, Ph.D., University of Wisconsin. Prof.

WILLIAM BRIAN DEFACIO, Ph.D., Texas A & M University. Assoc. Prof.

TERRY W. EDWARDS, Ph.D., University of Wisconsin. Assoc. Prof.

JUSTIN C. HUANG, Ph.D., Michigan State University. Assoc. Prof.

ROLAND A. HULTSCH, Ph.D., Iowa State University. Assoc. Prof.

ROBERT R. HURST, Ph.D., Pennsylvania State University. Assoc. Prof.

LEWIS D. MUHLESTEIN, Ph.D., Iowa State University. Assoc. Prof.

GUY SCHUPP, Ph.D., Iowa State University. Assoc. Prof.

JOSEPH E. WILLETT, Ph.D., University of Missouri-Columbia. Assoc. Prof.

RONNIE C. BARNES, Ph.D., Indiana University. Asst. Prof.

DAVID L. COWAN, Ph.D., University of Wisconsin. Asst. Prof.

KEUM H. LEE, Ph.D., Iowa State University.
Asst. Prof.

HENRY W. WHITE, Ph.D., University of California. Asst. Prof.

The Department of Physics offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy in Physics. There are many opportunities for specialization in both experimental and theoretical research.

In experimental research there are active programs in studying the electronic structure of defects in ionic crystals, electron spin resonance, nuclear magnetic resonance, X-ray diffraction, small angle X-ray diffraction, neutron diffraction, neutron inelastic scattering, photonuclear reactions, and nuclear spectroscopy. Active programs of research in theoretical physics include studies of plasma oscillations and related phenomena, the mathematical structure of relativistic scattering, nuclear structure theory, and the statistical mechanics of magnetic impurities.

The Department of Physics is housed in a new building (1966) with extensive research equipment available, including a variety of optical, X-ray, electron spin resonance, and nuclear spin resonance spectrometers. Electronics, glassblowing and machine shops, and a cryogenics laboratory which produces liquid nitrogen and liquid helium, are staffed to provide support for the research activities of students and faculty. At the University Research Reactor, the Department of Physics operates a dual double axis and triple axis neutron spectrometer, a low energy neutron time-of-flight spectrometer, as well as equipment for the study of photonuclear reactions and nuclear spectroscopy. Other facilities on campus of importance to the research activities of the Department include the Computational Services Center and an outstanding library.

Graduate assistantships, instructorships, O. M. Stewart Fellowships, NDEA Fellowships, NSF Traineeships, and Research Assistantships are available to graduate students in the Department of Physics. Information on these can be obtained by writing the Director of Graduate Studies, Department of Physics.

M.S. DEGREE

The Master of Science degree in Physics is designed to prepare students for careers as teachers in undergraduate colleges or as scientists in laboratories carrying on programs of development and research.

Since physics is the most basic of the physical sciences, graduate-level training in the field provides essential knowledge for use in modern scientific research in related fields. The Department of Physics recognizes the need for scientists with a broad level of training who can lead interdisciplinary programs of research and development.

Candidates for the Master of Science degree are encouraged to include advanced work in other scientific disciplines in their study program. Depending on one's interest, courses in such related fields as Astronomy, Biology, Chemistry, Computer Science, Engineering, Geology, and Mathematics may be applied to the requirements for the degree. If a student's interest is directed primarily toward a Ph.D. in Physics, he may be advised to concentrate most of his program in physics alone.

For a student to be accepted as an M.S. candidate he must have completed an undergraduate major in physics or have taken a Bachelor's degree with physics as his chief area of concentration. Students wishing to be candidates for the M.S. in physics, but whose undergraduate major was in another area, may be required to remedy deficiencies in their undergraduate physics program, which should have included at least, beyond the general physics sequence, intermediate and upper division class courses in heat, light, electricity and magnetism, mechanics, modern physics, and some laboratory experience. Knowledge of mathematics through differential equations is essential.

The specific program of study will be planned in consultation with the student's adviser but must include at least 30 hours of acceptable credits. These must include 6 hours of theoretical classical physics, 3 hours of quantum mechanics, 3 hours of solid state physics, and 3 hours of nuclear physics.

No thesis is generally required for the Master's degree, but some exposure to re-

search is considered essential. Students who wish to include study in related areas in their M.S. programs will be able to satisfy the research requirement in the related areas if they wish. Credits earned in research activities may be applied to the 30-hour M.S. requirement to the extent of 6 hours maximum. All students must include at least 3 hours of research in their program.

Beyond this basic core the student is allowed considerable flexibility. The balance of the 30 required hours may include other courses offered by the Physics Department or may be selected from offerings of departments in one of the related areas.

During his first year of graduate work a student is required to pass a Master's level qualifying examination. This examination, covering topics at the undergraduate level, will be offered at least twice yearly (at the beginning of each semester). On completion of the graduate course work, a written Master's Degree Examination is given covering primarily topics selected from the basic set of core courses.

All graduate students in physics are expected to take a full and active part in departmental activities. Participation in research programs, departmental lectures, and colloquia are considered a normal part of a graduate program.

THE Ph.D. DEGREE

The Doctor of Philosophy degree is designed for the education of scientists capable of independently formulating and solving problems of fundamental importance.

The general requirements for admission to graduate study in the Department are listed under the M.S. requirements above. An "Application for Candidacy for the Doctor of Philosophy Degree" must be filed before continuing study beyond 30 semester hours of graduate credit. A student who enters with a Master's degree from another institution must file the application during his first semester.

Before a student is accepted as a Ph.D. degree candidate, he must pass a qualifying examination covering primarily basic first year graduate work.

The specific program of study for a Doctor of Philosophy in Physics degree will be planned in consultation with the student's Advisory Committee and will be selected to fit each student's academic background, experience, and objectives.

Before a student will be permitted to take the final examination for his Ph.D. degree, he must have completed with a satisfactory grade a minimum of 9 semester hours of course credit in a foreign language approved by his Advisory Committee. It is hoped that this requirement will have been met during the student's undergraduate period of study.

When the candidate has essentially completed all planned course work, he will be required to pass a comprehensive examination consisting of two written parts, each nominally three hours, and one oral examination. At the time of the examination the candidate must have completed (or be currently enrolled in) all of the courses on his Ph.D. program. In special cases he may be allowed to take the examination with one course outstanding.

The candidate shall carry out original research and present an acceptable doctoral dissertation on a topic approved by the candidate's Advisory Committee and will defend his dissertation in a final examination.

PHYSIOLOGY

JAMES O. DAVIS, Ph.D., University of Missouri-Columbia. M.D., Washington University. Chairman; Prof.

DALLAS K. MEYER, Ph.D., University of Missouri-Columbia. Director of Graduate Studies, Prof.

DOUGLAS M. GRIGGS, M.D., University of Virginia. Prof. of Physiology and Medicine.

XAVIER J. MUSACCHIA, Ph.D., Fordham University. Prof.

WESLEY S. PLATNER, Ph.D., University of Missouri-Columbia. Prof.

PATRICK D. HARRIS, Ph.D., Northwestern University. Assoc. Prof.

MARVIN L. ZATZMAN, Ph.D., Ohio State University. Assoc. Prof.

RICHARD G. COOPER, Ph.D., University of Texas. Asst. Prof. of Agricultural Chemistry and Physiology.

J. ALAN JOHNSON, Ph.D., Indiana University. Asst. Prof.

FERRILL A. PURDY, A.M., University of Missouri-Columbia. Asst. Prof.

The Department of Physiology provides interdisciplinary graduate programs leading to degrees of Master of Arts and the Doctor of Philosophy in Physiology. These programs utilize the Departments of Anatomy, Biochemistry, Biological Sciences, Microbiology and Psychology, and the Schools of Agriculture, Veterinary Medicine, and Engineering for support in giving students in Physiology a breadth of knowledge.

The Master of Arts program in Physiology is designed to give the students an in-depth exposure to Mammalian Physiology and cognate fields. It provides experience in experimental design of physiological research and in research itself. This degree may serve as an introduction to advanced biological studies for the student interested in moving from the physical sciences into biophysics or bioengineering. In exceptional cases an M.A. in Physiology may be obtained concurrently with work toward the M.D. degree. Students intending to make a career of physiological teaching and research may proceed with permission of the staff directly to a Ph.D. program without taking a Master's degree.

The Ph.D. program in Physiology is designed to prepare the candidate for a career in research or teaching or both. The culmination of his program is the completion of a meritorious and original research project, writing a dissertation on his research, and the defense of this dissertation before a graduate committee. It is strongly recommended that the candidate further his academic education with one or more years of postdoctoral training. All Ph.D. candidates, regardless of their source of support, are required to participate in the laboratory or lecture room instruction of Elementary Physiology 201 or Medical Physiology 250 at some time during the graduate program.

Emphasis is on Mammalian Physiology, and while advanced study in this field is directed to the discovery and understanding of basic physiological mechanisms in higher organisms, its application to the fields of Medicine, Veterinary Medicine, Agriculture, and related studies is obvious.

Departmental areas of specialization within the field of Mammalian Physiology are in Renal, Cardiovascular, Endocrine,

Comparative, and Environmental Physiology. This is reflected by the research interests of the department which may be categorized as cardiovascular, renal, and environmental physiology. More specifically, research problems under active investigation are: the renin-angiotensin mechanisms, control of coronary circulation, cardiac metabolic rhythm, control of microcirculation, control of sodium excretion by the proximal tubule, lipid metabolism, physiological functions in the hypothermic and the hibernating animal, and blood clotting.

Departmental members maintain research laboratories on the fourth floor of the Medical Sciences building and in the Space Sciences Research Center. These laboratories, the best equipped physiological laboratories in the State, have available a wide range of sophisticated physiological instrumentation for the gathering of quantitative physiological data at both the chemical and physical levels. The laboratories are equipped for physiological research on large and small mammals. Equipment includes Sanborn, Grass, and Electronics electronic recording equipment, Packard Scintillation Counters, Autoanalyzers, gas chromatographs, analog computers, recording spectrophotometers, environmental chambers, and other equipment for accurate analysis of chemical and physical properties of living organisms. Also available are the general service facilities on the UMC campus such as animal care facilities, the nuclear reactor, and the computer center.

The extensive scientific collection of the medical library is available to students and staff. This is supplemented by a small but conveniently located departmental library.

The presence of postdoctoral fellows within the department contributes to the education of the degree candidates.

Financial support for qualified graduate students is available from a number of sources. The student himself may apply for an NDEA, NSF, NASA, or NIH fellowship. The department also has a cardiovascular training grant which supports four graduate students and four postdoctoral fellows. There are four graduate teaching assistantships and a number of students are supported from the research grants of

the staff. Information on entrance to the graduate program in Physiology and the sources of financial support may be obtained from the departmental chairman.

THE M.A. PROGRAM IN PHYSIOLOGY

Selection of students is based upon a combination of the following criteria: (1) a 3.0 or higher overall grade-point average in undergraduate work ($A=4.0$). However, the student's transcript is evaluated in detail rather than considering only the GPA; (2) each applicant must complete the department's application blank, submit three letters of recommendation from senior professors, and take the Graduate Record Examination. The applicant must take Part I (the general aptitude test) and his score should not fall below the fiftieth (50) percentile. He is also required to take the advanced test in one (or more) of the following subjects: Biology, Chemistry, Engineering, Mathematics, Physics, or Psychology. If the applicant took the test more than four years ago, he will have to take it again. The transcript of test scores must be received by the department directly from the Educational Testing Service; (3) the following courses are required prior to entrance into the graduate program, although a superior student, lacking some of these courses, may take them while pursuing his Master's degree: Biology—a college major or minor in zoology or related fields; Chemistry—inorganic chemistry, qualitative and quantitative chemistry, organic chemistry through aromatic compounds, physical chemistry; Physics—one year of college physics; and Mathematics—college mathematics through calculus.

There is no language requirement for the Master's degree. A student must fulfill the Graduate School regulations given elsewhere in this bulletin. These set the minimum course requirements at 30 hours of graduate credit; 15 or more must be in 400-level courses and not more than 12 may be in research.

The typical candidate for the M.A. in Physiology will take Physiology 305 (10 hours), biochemistry (5 hours), biophysics (3 hours), and such other courses that his adviser designates as necessary to give

breadth to his program or to remedy omissions in his undergraduate curriculum. The program, of necessity, frequently exceeds the minimum 30 hours. The student must maintain a *B* or better average. The candidate must submit a thesis and defend it in an oral examination.

THE Ph.D. PROGRAM IN PHYSIOLOGY

The entrance requirements concerning the GPA of 3.0 (on a 4.0 system) and the GRE are the same as those in the M.S. Program. An applicant for the Ph.D. program should also use the department's application blank and submit three letters of recommendation from senior professors. In addition, he will be required to pass a written and an oral qualifying examination administered by members of the Physiology faculty during the first year of his Ph.D. program.

Three years of residence are required; this is equivalent to about 88 semester hours of credit.

The candidate must also fulfill the following degree requirements: complete the program of study approved by the candidate's planning committee; demonstrate by examination a reading knowledge of two foreign languages, or of one foreign language and complete a collateral field; pass a comprehensive examination in mammalian Physiology and such related fields as deemed essential by the examining committee; complete a meritorious, original piece of research for his dissertation; and comply with the residence and other requirements set by the Graduate School.

PLANT PATHOLOGY

ROBERT N. GOODMAN, Ph.D., University of Missouri-Columbia. Chairman; Prof.

THOMAS D. WYLLIE, Ph.D., University of Minnesota. Director of Graduate Studies; Prof.

VICTOR H. DROPKIN, Ph.D., University of Chicago. Prof.

WILLIAM Q. LOEGERING, Ph.D., University of Minnesota. Prof.

DANIEL F. MILLIKAN, Ph.D., University of Missouri-Columbia. Prof.

OSCAR H. CALVERT, Ph.D., University of Wisconsin. Assoc. Prof.

EINAR W. PALM, Ph.D., North Dakota State University. Assoc. Prof.

OM P. SEHGAL, Ph.D., University of Wisconsin.
Assoc. Prof.
BILLY G. TWEEDY, Ph.D., University of Illinois.
Assoc. Prof.
CHARLES H. BALDWIN, Ph.D., Oregon State University. Asst. Prof.
MERTON F. BROWN, Ph.D., University of Iowa.
Asst. Prof.
ANTON NOVACKY, Ph.D., Czechoslovak Academy of Sciences. Asst. Prof.

The Department of Plant Pathology of the College of Agriculture offers graduate work leading to the degree of Master of Science in Plant Pathology. The Department also cooperates with the Department of Pathology of the School of Medicine and the Department of Veterinary Pathology of the School of Veterinary Medicine in offering a new area Ph.D. program in Pathology. The information on that program is presented in the section on Area Programs following this section of the bulletin which lists degree offerings by the departments.

A student in plant pathology will find the following areas of concentration offered: ultrastructure research bearing on host-plant pathogen interactions, phytobacteriology, intermediary metabolism of plant pathogenic fungi, ecology of soil-borne plant pathogenic fungi, plant pathogenic viruses, clinical plant pathology.

Stipends are derived from the College of Agriculture Experiment Station, NIH, NSF, and NDEA Funds. For information and application forms, write the Director of Graduate Studies, Department of Plant Pathology.

THE M.S. DEGREE

To be considered for admission to the M.S. program in Plant Pathology, an applicant should have a B.S. degree with at least a 3.0 grade-point average ($A=4.00$) and at least 15 hours of biological sciences in undergraduate work.

There is no language requirement. Other departmental requirements are those set by the Graduate School and presented elsewhere in this bulletin.

A cumulative grade-point average of 3.0 or better is required with no more than two grades of C or lower allowed during the study period for the Master's degree.

POLITICAL SCIENCE

ARTHUR L. KALLEBERG, Ph.D., University of Minnesota. Chairman; Prof.
DEAN L. YARWOOD, Ph.D., University of Illinois. Director of Graduate Studies; Assoc. Prof.
SOON SUNG CHO, Ph.D., University of Michigan. Prof.
RONDAL G. DOWNING, Ph.D., University of Illinois. Prof.
STANLEY T. GABIS, Ph.D., University of Chicago. Prof.
LOUIS G. KAHLE, Ph.D., University of Texas. Prof.
ROBERT F. KARSCH, Ph.D., University of Missouri-Columbia. Prof.
DAN NIMMO, Ph.D., Vanderbilt University. Prof.
FREDERICK C. SPIEGEL, Ph.D., University of Illinois. Prof.
RICHARD A. WATSON, Ph.D., University of Michigan. Prof.
LLOYD M. WELLS, Ph.D., Princeton University. Prof.
DAVID M. WOOD, Ph.D., University of Illinois. Prof.
RICHARD R. DOHM, Ph.D., University of Minnesota. Assoc. Prof.
DAVID A. LEUTHOLD, Ph.D., University of California. Assoc. Prof.
PAUL WALLACE, Ph.D., University of California. Assoc. Prof.
STANLEY B. BOTNER, Ph.D., University of Missouri-Columbia. Asst. Prof.
GREGORY CASEY, Ph.D., Georgetown University. Asst. Prof.
ROGER E. DURAND, Ph.D., University of California. Asst. Prof.
ARTHUR J. LERMAN, M.A., Princeton University. Asst. Prof.
CHARLES G. NELSON, Ph.D., Indiana University. Asst. Prof.
MARVIN L. ROGERS, Ph.D., University of California. Asst. Prof.
DAVID C. STURTEVANT, Ph.D., M.A., University of California. Asst. Prof.
JOHN R. SWANSON, Ph.D., University of Wisconsin. Asst. Prof.

The Department of Political Science offers graduate work leading to the degrees of Master of Arts (two programs) and Doctor of Philosophy in Political Science, and Master of Science in Public Administration.

It is the objective of the Department to train people who will qualify as experts through their detailed knowledge of government and to encourage them to acquire a background in other disciplines, especially in the social sciences and humanities,

broad enough to enable them to correlate their specialized knowledge with all aspects of modern life. The Doctor of Philosophy degree program is designed to prepare the student for a career in research and college teaching. The M.A. degree programs are designed to prepare the student for teaching at the junior college level or as a stepping stone toward candidacy for the Ph.D. degree. The M.S. in Public Administration is intended for students interested in city management, State and Federal government administration, or in research organizations concerned with these fields.

The Department, with assistance of an NDEA Grant, started a special program in 1964—the Public Opinion Survey Unit; renewal and expansion of the grant has made possible the expansion of the program which is described in the section on research resources. In addition to its field section, POSU maintains a data library. Courses in public opinion and voting behavior provide students with training in survey techniques, the use of survey data and computer applications.

Another NDEA-supported studies program in which the Department plays an important role is the South Asian Language and Area Center. Courses are available in Asian civilization, history, sociology, geography, philosophy, and South Asian language, in addition to political science.

A fair amount of specialization is possible also in such areas as Latin America, East Asia, the Soviet Union, and Western Europe, by combining political science courses with courses in history, economics and philosophy, to mention only a few.

Through the department's membership in the Inter-University Consortium for Political Research, students are eligible for summer training in quantitative analysis and research design at the University of Michigan.

The University of Missouri-Columbia Library is well stocked with books, periodicals, and government documents pertaining to the study of political science and related social science fields. In recent years special efforts have been made to increase material on South Asia, the Soviet Union, East Asia, and Latin America. For those interested in the government and politics of

Missouri, the library of the State Historical Society offers additional materials, including a large collection of State newspapers. The State capital, Jefferson City, is only 30 miles from Columbia, so that students interested in State government can easily keep in close contact with State governmental agencies and may have access to materials from such agencies.

Students may apply for NDEA and NSF fellowships, teaching and research assistantships, as well as University and South Asia fellowships and scholarships. Applicants for financial assistance must submit GRE scores to the Department. About 25 departmental teaching assistantships offer stipends varying between \$2,640 and \$4,500 per year. About six research assistantships are available in the Research Center of the School of Business Administration, the majority of them in the Public Opinion Survey Unit. Other research assistantships are paid on an hourly basis. University fellowships and scholarships generally involve part-time teaching or research assistantships with stipends beginning at \$2,600, to which summer grants may be added. For application blanks for research and teaching assistantships and fellowships and for additional information on the Department's graduate program, write the Director of Graduate Studies, Department of Political Science.

DEGREE REQUIREMENTS

For admission to graduate study in political science an applicant should preferably have had an undergraduate major in political science or at least six hours of upper-level course work in political science. Such work shall not be included in any graduate degree program. A major in another area may be acceptable but each such case will be judged on its own merits. An applicant must have an overall undergraduate GPA of at least 3.0 as well as a 3.0 in political science courses ($A=4.0$). Applicants should take the GRE aptitude test and the advanced test in government, and have the results reported to the Department's Director of Graduate Studies at the time of applying for admission. Those finding it impossible to comply with this requirement should take the GRE as soon after applying as possible but no

later than during the first semester in residence as a graduate student at UMC.

The Master of Science in Public Administration degree program is open to those who, in addition to meeting the basic requirements, have, in the opinion of the public administration advisers, an academic background sufficient for graduate study in this field. Degree requirements are 32 semester hours, including at least nine in 400-level political science courses, eight in Political Science 450 (Research, non-thesis), and 15 of related electives. The non-thesis research may be completed either by the preparation of research papers or by internship experience with written reports (to be arranged with local, State, or Federal government agencies) or by a combination of the two. The comprehensive examination is oral.

The Master of Arts degree may be earned by completing either a thesis program or non-thesis one. The thesis program requires 24 hours of course work (at least eight in 400-level courses) and an acceptable thesis. The non-thesis program requires 30 hours, at least 15 of which are to be distributed among 400-level courses. If the student wishes to advance from the non-thesis master's program to the Ph.D. program, he will take 24 hours of course work and write a master's paper (for which he will receive 6 hours credit). Students who do not continue for the Ph.D. will enroll in 30 hours of course work. Both the thesis and non-thesis programs culminate with a comprehensive oral examination. There are no specific course requirements for the M.A., but each candidate shall take an upper-level course in each of the six fields of political science: comparative government, international affairs, political theory, politics and legislation, public administration, and public law. An M.A. candidate must maintain a *B* or better average, and his candidacy will be terminated for more than six hours of *C* in political science courses.

Acceptance to Ph.D. candidacy shall be determined by a committee's consideration of the applicant's performance on the GRE, written and oral special qualifying examinations, and letters of recommendations. The student is permitted flexibility in

planning his Ph.D. program. He is expected to offer a program which shall include at least 48 hours of graduate work. At the option of the student's advisory committee, not more than 24 hours of the M.A. program may be included in the Ph.D. program. Such a program shall include at least 36 hours distributed among four of the six fields of political science plus at least 12 hours in an outside field or combination of fields. In addition to completing the necessary course work, the candidate must demonstrate the capacity to use a research tool associated with another academic discipline (e.g., a foreign language or statistics), must pass a written and oral comprehensive exam, and must submit and defend a dissertation. A Ph.D. candidate is expected to maintain a 3.25 GPA in political science courses taken for graduate credit.

POULTRY HUSBANDRY

J. E. SAVAGE, Ph.D., University of Missouri-Columbia. Chairman; Director of Graduate Studies; Prof.

ERNEST M. FUNK, Ph.D., University of Wisconsin. Prof. Emeritus

QUINTON B. KINDER, M.A., University of Missouri-Columbia. Prof.

ALFRED B. STEPHENSON, Ph.D., Iowa State University. Prof.

HAROLD V. BIELLIER, Ph.D., University of Missouri-Columbia. Prof.

The Department of Poultry Husbandry provides graduate study leading to the degrees of Master of Science and Doctor of Philosophy in Poultry Husbandry.

Graduate programs in Poultry Husbandry are designed to prepare students for advanced professional careers in industry, research, and college teaching. Poultry science is a broad and rapidly changing field which demands a wide variety of training. Accordingly, graduate programs in poultry science include course work in biochemistry, economics, genetics, management, marketing, microbiology, nutrition, physiology, statistics, and zoology.

The Department of Poultry Husbandry cooperates closely with scientists in government, industry, and at other state in-

stitutions, with national and local firms, and with the professional associations for these groups.

The Department has access to a controlled environmental physiology laboratory, nutrition research laboratory, experimental animal research facilities, and three research farms. Also, the Department has chromatography, electrophoresis, histology, isotope and automated amino acid analytical instrumentation available.

The Departmental library contains scientific journals, periodicals, and other references in Poultry Science.

Practical experience in teaching and research is provided. Fellowships, scholarships, and research assistantships are available to qualified graduate students. Applications should be submitted by March 1 each year. Additional information can be obtained from the Chairman, Department of Poultry Husbandry, College of Agriculture.

THE M.S. DEGREE REQUIREMENTS

The Master of Science degree in Poultry Husbandry is a professional program which is designed by the student and his adviser to provide basic concepts, techniques, and organization within the following subject areas: genetics, management, nutrition, and physiology.

To be accepted as a candidate in the Master's program, a student must meet the requirements of the Graduate School and have a B.S. in Agriculture, or, if another baccalaureate degree is offered, the candidate must have included in his undergraduate work a total of 30 credit hours in science subjects. Deficiencies in this or in essential technical agricultural subjects may be corrected by additional course work.

To satisfy requirements for the Master's degree, a student must have completed substantially all course requirements for the undergraduate degree in Poultry Husbandry and meet the requirements of the Graduate School with 15 of the required minimum of 30 hours to be in 400-level courses. There is no language requirement. A thesis is required at the discretion of the adviser.

THE Ph.D. DEGREE REQUIREMENTS

The Department of Poultry Husbandry accepts candidates for the Ph.D. degree on the basis of (1) performance on the GRE and the Miller Analogies test, (2) consideration of scholastic performance, experience, maturity and other factors affecting probable success in the program, and (3) results of a written and/or oral qualifying examination. Students who receive their Master's degree at UMC may have the Master's degree examination accepted as the qualifying examination.

The program requires two or more years beyond the Master's degree and consists of an individually planned program of study, practical experience in teaching and research, examination over accumulated knowledge in a major field, completion of departmental language requirements—proficiency in two foreign languages or on one foreign language and one research technique (a collateral field acceptable to the advisory committee may substitute for the research technique), and demonstration of research and writing ability by completing a doctoral dissertation on an approved research topic.

Acceptable research techniques are: mathematics, statistics, computer programming, instrumental analysis, radiochemistry and histology.

A student should refer also to the regulations governing the doctoral degree as given elsewhere in this bulletin.

PSYCHOLOGY

DAVID G. McDONALD, Ph.D., Washington, St. Louis. Chairman; Director of Graduate Studies; Prof.

WAYNE ANDERSON, Ph.D., University of Missouri-Columbia. Prof.

BRUCE BIDDLE, Ph.D., University of Michigan. Prof.

JUNE CHANCE, Ph.D., Ohio State University. Prof.

ROBERT S. DANIEL, Ph.D., Indiana University. Prof.

ALVIN GOLDSTEIN, Ph.D., Clark University. Prof.

DONALD H. KAUSLER, Ph.D., Washington University. Prof.

CHARLES J. KRAUSKOPF, Ph.D., Ohio State University. Prof.

ALVIN LANDFIELD, Ph.D., Ohio State University. Prof.
 WILLIAM H. LICHTER, Ph.D., University of Iowa. Prof.
 FRED MCKINNEY, Ph.D., University of Chicago. Prof.
 MELVIN MARX, Ph.D., Washington University. Prof.
 JEROME D. PAUKER, Ph.D., Washington University. Prof.
 JOSEPH THORPE, Ph.D., University of Texas. Prof.
 DOUGLAS ANGER, Ph.D., Harvard. Assoc. Prof.
 ROBERT BOICE, Ph.D., Michigan State University. Assoc. Prof.
 KENNETH B. BROWN, Ph.D., Iowa State University. Assoc. Prof.
 RUSSELL GEEN, Ph.D., University of Wisconsin. Assoc. Prof.
 THEODORE F. HENRICH, Ph.D., University of North Carolina. Assoc. Prof.
 JOHN MUELLER, Ph.D., St. Louis University. Assoc. Prof.
 ALGIMANTAS SHIMKUNAS, Ph.D., St. Louis University. Assoc. Prof.
 MARK H. THELEN, Ph.D., Michigan State University. Assoc. Prof.
 DAVID T. VERNON, Ph.D., University of Chicago. Assoc. Prof.
 LEE A. BECKER, Ph.D., Ohio State University. Assoc. Prof.
 JAMES CLARK, Ph.D., Michigan State University. Asst. Prof.
 ROBERT DOLLIVER, Ph.D., Ohio State University. Asst. Prof.
 JOSEPH DOSTER, Ph.D., Emory University. Asst. Prof.; Director, Psych. Dept. Clinic
 DANIEL HAYS, Ph.D., University of Missouri-Columbia. Asst. Prof.
 MARJORIE MARLIN, Ph.D., University of Illinois. Asst. Prof.
 DENNIS WRIGHT, Ph.D., University of California. Asst. Prof.
 LEONARD P. YOSPE, Ph.D., University of Missouri-Columbia. Lecturer

The Department of Psychology offers a broad choice of advanced degree programs. The Master of Science degree can be granted in the field of college teaching in psychology or, in conjunction with the College of Education, in the field of counseling techniques. The Master of Arts and Doctor of Philosophy degrees are offered in general-experimental psychology, clinical psychology, counseling psychology, social psychology, and personality-developmental psychology.

Financial aids are available through departmental research and teaching assistant-

ships; Graduate School fellowships; NDEA, Gregory, and NSF Fellowships. Other Federal agency funds are available to qualified graduate students. These include U.S. Public Health Service Traineeships in social psychology and clinical psychology, and Veterans Administration stipends in clinical psychology and counseling psychology.

The department maintains a Psychology Animal Research building with varied equipment for the study of animal learning, motivation, comparative behavior, and physiological correlates of behavior. A fully-equipped laboratory for the study of the electroencephalogram and muscle action potentials is also in use. The department arranges training facilities at Fulton State Hospital, Mid-Missouri Mental Health Center, University of Missouri-Columbia Testing and Counseling Service (including the Mental Health Clinic), and in research laboratories.

The program in General and Experimental Psychology is considered to be of fundamental importance in the total graduate division of the department. Faculty and graduate students are active in research, and training follows the philosophy of learning-by-doing. The aims of the program are: to give the student a thorough background in statistics, scientific methodology, and content courses; and to bring these to a focus in student research projects and collaboration in faculty research in the areas of learning, perception, physiology, motivation, child, personality, and the like. The biweekly departmental seminar provides an opportunity for students to present research reports and to hear from faculty and visiting psychologists. A number of faculty research programs are supported by grants which also provide stipends and training opportunities for students. Integration of research training with specialty training is stressed. The usual Ph.D. program in experimental psychology includes around 30 semester hours in research.

The program in Clinical Psychology, which is approved by the American Psychological Association, is under the direction of a director and a committee made up of staff members who specialize in this

area. The philosophy of training is to achieve a balance between scientific and service activities. The program prepares students for teaching, research, and service in universities, clinics, hospitals, and similar agencies. In addition to the research emphasis and training in basic areas of psychology which characterize all of the programs in the department, clinical students obtain training in behavior theory and dynamics and in techniques of assessment and behavior change. Supervised experience is provided through practicum courses in the department's Psychological Clinic and by paid clerkships and internships in campus and other cooperating institutions.

The program in Counseling Psychology is patterned after the American Psychological Association's recommendations and is offered in conjunction with the College of Education. It is designed to train psychologists for work in universities, the Veterans Administration, and public or private agencies. Emphasis of the program is on research and a strong basic foundation in general behavior theory, followed by intensive training in supervised practicums and internships. Facilities for the latter part of the program are provided by local agencies (e.g. the UMC Testing and Counseling Service), State and Federal agencies, and the V.A.

The program in Social Psychology is jointly presented with the Department of Sociology. Like the other Ph.D. programs of the psychology department, it has a research emphasis. The goal is to provide thorough preparation for careers in research, teaching, and the service functions of social psychology. Some of the specialized course work may begin in the first year, with concentrated seminars and other courses coming in the second and third years. Emphasis is given to personality theory, behavior dynamics, role theory, small group theory, and other aspects of this rapidly developing area. In addition to the general research training in the department, there are opportunities for research experience in the Center for Research in Social Behavior.

These programs and others are more fully described in brochures available from the department chairman.

DEGREE REQUIREMENTS

Those who wish to become graduate students in psychology and work toward an advanced degree must complete application forms which can be obtained from the department. There are no rigid requirements, but most students who are accepted have an undergraduate major in psychology or its equivalent. Acceptance is based on training, quality of work, recommendations, GRE and Miller Analogies Test scores, and other information. Graduate students who have not been accepted by the department may not take psychology courses at the 400 level.

Degree requirements for the M.A. include 30 hours of course work and 6-8 hours of research credit for an experimental thesis in publishable form. An oral examination on the thesis is required.

M.S. degree requirements are 40 hours, including 3-6 hours in Psychology 400 or 450 (non-thesis research). Also required is a special investigation (experimental or scholarly) submitted in written form to the student's committee which subsequently conducts an oral examination on the report.

The Ph.D. qualifying examination requirement is satisfied by successful completion of the Core Curriculum or evaluation of the thesis for those who possess the M.A. degree.

General requirements for the Ph.D. include 10-12 hours of Core Curriculum courses, three courses in statistics, 2 hours of Staff Pro-Seminar, special methods and skills courses (including dissertation research), and a selection of courses in the main area of concentration. Practicum and



certain other courses are required for the counseling and clinical programs.

Other requirements are: one year of full-time, paid professional experience (or equivalent); a dissertation; and comprehensive and final oral examinations.

RECREATION AND PARK ADMINISTRATION

GLENN A. GILLESPIE, Ph.D., University of Missouri-Columbia. Chairman; Director of Graduate Studies; Assoc. Prof.

KEITH B. ROYS, SR., Ph.D., University of Illinois. Prof.

ETHEL O. SCOTT, Ph.D., University of Minnesota. Asst. Prof.

ROGER D. FORD, M.S., Montana State University. Asst. Prof.

The Department of Recreation and Park Administration offers graduate work leading to a Master of Science degree. There were approximately 133 majors and 11 faculty members at the end of the 1969-70 school year.

The special areas of concentration include those of public recreation, therapeutic recreation, and outdoor recreation.

Students in the area of therapeutic recreation can gain practical experience in the University of Missouri-Columbia Department of Physical Medicine and Rehabilitation. They have use of the therapy facilities of the UMC Medical Center and, under supervised conditions, work with patients there. Local park and recreation officials cooperate with students in the areas of public and outdoor recreation.

Most graduates of the program enter careers in public park and recreation departments, in the National Park Services, various therapeutic settings, and youth-serving agencies. Assistantships are available, but presently on a limited basis.

THE M.S. DEGREE PROGRAM

To be admitted to the Master's program, a student should have a baccalaureate degree with a major in Recreation and Park Administration (or the equivalent), or make up deficiencies. He should have a solid undergraduate foundation in the humanities, the social and behavioral sciences,

and courses in health and physical education.

For advisement purposes, an applicant should take the Strong Vocational Interest Blank, Miller Analogies Test, Ohio State Psychological Test, and the Cooperative English Test. A student should refer to the general regulations for the Master's degree given elsewhere in this bulletin.

There is no language requirement. The following are the requirements of the program: 14 hours in Recreation and Park Administration Theory, six hours professional field experience or optional field, six hours of electives, six hours of thesis or optional field. If the student does not write a thesis, he will take a minimum of six credit hours in a related area and one credit hour of Recreation 400 in which he must conduct an approved research project. Each graduate student will be assigned to a committee of three members. They will evaluate any research completed and administer a final oral examination.

A student who receives a grade of C or below in more than one Recreation course is subject to dismissal from the program.

REGIONAL AND COMMUNITY AFFAIRS

LEE J. CARY, Ph.D., Syracuse University. Chairman; Director of Graduate Studies; Prof.

HARRY L. NAYLOR, Ph.D., University of New Mexico. Assoc. Prof.

BRYAN M. PHIFER, Ph.D., University of Chicago. Prof.

HUGH DENNEY, M.A., University of Missouri-Columbia. Prof.

BOYD FAULKNER, M.S., University of Nebraska. Asst. Prof.

E. FREDERICK LIST, M.A., Washington University. St. Louis. Assoc. Prof.

DONALD W. LITRELL, M.S., University of Missouri-Columbia. Asst. Prof.

GEORGE F. NICKOLAUS, J.D., University of Missouri-Columbia. Asst. Prof.

GLENN E. VARENHORST, M.S., University of Wisconsin. Assoc. Prof.

The Department of Regional and Community Affairs offers a program of graduate work leading to a Master of Science in Community Development. This degree program is one of only three such programs offered in the United States. The University of Missouri-Columbia's program

is designed to prepare students for beginning professional practice. Specific courses and field experience help to prepare students for urban careers, rural and regional positions, and international work.

In addition, the Department offers (1) a one-year Diploma Program for international students and (2) a state-wide community development program as part of the University Extension Service. The department maintains a departmental community development reference library.

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. However, to be accepted for advisement for the Master's degree in Regional & Community Affairs, a student should preferably have completed a minimum of 20 hours in social sciences and at least one course in statistics. An overall GPA of at least 2.50 is also required.

A total of 48 credit hours is required for a Master of Science in Community Development. The core curriculum consists of 33 credit hours in the Department of Regional and Community Affairs. This is made up of designated courses, including 9 hours of field experience required of all students. The remaining 15 hours consist of elective courses selected by the student and his adviser. Electives may be selected from non-core courses in the Department of Regional and Community Affairs and appropriate courses offered by other departments.

Either a thesis (CD 490) or a research project (CD 450) is required. Before the Master's degree will be granted the student must pass both a written and oral comprehensive examination. See also the regulations for Master's degrees as listed elsewhere in this bulletin.



ROMANCE LANGUAGES

- KERNAN B. WHITWORTH, JR., Ph.D., Princeton University. Chairman; Prof. of French
 DANIEL C. SCROGGINS, Ph.D., University of Michigan. Assoc. Chairman; Assoc. Prof. of Spanish
 ALBERT BRENT, Ph.D., Princeton University. Director of Graduate Studies; Prof. of Spanish
 BOYD G. CARTER, Ph.D., University of Illinois. Prof. of Romance Languages
 M. BONNER MITCHELL, Ph.D., Ohio State University. Prof. of French and Italian
 WILLIAM H. SHOEMAKER, Ph.D., Princeton University. Visiting Prof. of Spanish
 HAROLD G. JONES, III, Ph.D., Princeton University. Assoc. Prof. of Spanish
 EBION DE LIMA, Ph.D., Catholic University of Sao Paulo. Assoc. Prof. of Portuguese
 EDWARD J. MULLEN, Ph.D., Northwestern University. Assoc. Prof. of Spanish
 MARGARET S. PEDEN, Ph.D., University of Missouri-Columbia. Assoc. Prof. of Spanish
 VERN G. WILLIAMSEN, Ph.D., University of Missouri-Columbia. Assoc. Prof. of Spanish
 DANIEL A. BOHEME, Ph.D., University of Chicago. Asst. Prof. of French
 RICHARD K. DIXON, Ph.D., University of Colorado. Asst. Prof. of French
 DANIEL E. GULSTAD, Ph.D., University of Illinois. Asst. Prof. of Spanish and Linguistics
 BENJAMIN L. HONEYCUTT, Ph.D., Ohio State University. Asst. Prof. of French
 JOHN M. HOWIE, Ph.D., Indiana University. Asst. Prof. of French and Linguistics
 HOWARD T. MANCING, Ph.D., University of Florida. Asst. Prof. of Spanish
 JAMES K. WALLACE, Ph.D., Vanderbilt University. Asst. Prof. of French

The Department of Romance Languages offers programs of study leading to the degrees of Master of Arts in French or Spanish, Master of Arts for Teachers of French or Spanish, and Doctor of Philosophy in French, Spanish, or Spanish American Literature. A person interested in working for any one of these degrees should first write to the department chairman, stating his desire to enter the department and requesting an application form. When submitted, the application form should be accompanied by a transcript of all undergraduate and graduate work completed and GRE scores on both the aptitude and the advanced French or Spanish examinations. If accepted by the department, the student will then be notified to apply for admission to the Graduate School through the Office of Admissions, 130 Jesse Hall.

Part-time teaching assistantships, as well as a limited number of scholarships and fellowships are available to departmental graduate students. A student interested in being considered for one of these appointments should so indicate in his initial letter to the chairman and on the application form.

All candidates for an advanced degree in this department (except native speakers of French or Spanish) will be given a language proficiency examination at the time of entrance to determine their ability to speak, understand, read, and write their language of specialization. Students who are deficient in ability to speak and understand will be required to register for course 209, Advanced Conversation. If they are deficient in writing ability they will be required to register for course 402, Composition for Graduate Students.

THE M.A. DEGREE (French or Spanish)

The student may take his work wholly in French or wholly in Spanish, or he may elect a minor in one of the following fields of study: for a major in French—Spanish, Italian, Portuguese, German, Russian, Latin, English, Art History, Philosophy, European History, Linguistics, Education; for a major in Spanish—French, Italian, Portuguese, German, Russian, Latin, English, Linguistics, European History, Latin American History, Art History, Philosophy, Education. Other minor fields may be selected subject to the Department's approval.

A total of 30 hours, selected from courses receiving graduate credit, must be completed. In a major-minor combination, a minimum of 20 hours must be in the major subject, and a minimum of 10 hours in the minor field. At least 15 hours must be in courses numbered 400 or above. No more than 12 hours credit is allowed for research, problems, and special readings (courses 490, 400, and 350). A course in composition (French 402 or Spanish 402) and a course in the history of the language (French 311 or Spanish 361) must be included in the study program. Course 402 may not be used to satisfy the requirements of 15 hours of 400-level courses. A student with fewer than four courses (nor-

mally 12 hours) at the undergraduate level in literature in his major field must make up this deficiency.

A student teaching 5-7 hours as an assistant in the Department may take 12-14 hours of course work per semester; 8-11 hours teaching, 9-11 hours coursework; 12-15 hours teaching, 6-8 hours coursework. See other regulations elsewhere in this bulletin.

The writing of a thesis is optional; however, students who contemplate working for the doctorate are encouraged to write one. The thesis counts for six hours toward the 30-hour requirement.

All candidates for the degree of Master of Arts in this department are required to pass a six-hour written examination based upon the M.A. reading list. Copies of the list are available in the Departmental Office, 27 Arts & Science building. This examination is given in October, in April, and in July. Two failures on the final examination will eliminate the candidate from consideration for the M.A. degree. If an official minor is offered, the candidate will be examined in it as well as in his major field.

THE M.A.T. DEGREE (French or Spanish)

The degree Master of Arts for Teachers is designed to meet the needs of the secondary school teacher and the prospective secondary school teacher. For this reason, the degree is not intended to be a step toward the Ph.D. as is the traditional M.A. However, some of the work required for the degree would be applicable to the Ph.D. if the candidate should later elect a scholarly career.

A candidate for the degree should hold a permanent teaching certificate in the State of his residence before beginning work on the degree. If he does not hold such a certificate, he will be expected to fulfill requirements for certification before the degree is awarded and in addition to the requirement of 30 hours. Specific required courses for the degree may be completed in any two successive summers; any remaining work for the degree may be taken in additional summer sessions or regular terms. The candidate will be required to complete the following courses

unless he can demonstrate to the department that he already has mastered their content: French (Spanish) 256; Stylistics (three hours—directed toward persons who have been teaching the language); French (Spanish) 259; Advanced Oral Studies (three hours—directed toward persons who have been teaching the language); Romance Languages 370; Linguistics for Teachers of Romance Languages (three hours); Romance Languages 380; and Advanced Study in the Techniques of Language Teaching (three hours—teaching experience is a normal prerequisite). Except as required above, 200-level courses in the student's field of specialization may not be taken for graduate credit; he may take for graduate credit 200-level courses in a second foreign language. No more than 12 hours of 200-level courses may be used to satisfy degree requirements. The candidate is required to offer at least one course on the 400 level for graduate credit, either in his field of specialization or in some other field as approved by the Department. The candidate must offer at least one course numbered above 200 in a field related to his specialization. No more than nine hours may be taken outside the Department.

Successful completion of courses 256 and 259 does not necessarily mean that the candidate will be considered qualified in the use of the language. He may be advised to undertake self-improvement on a non-credit basis. There will be a Final Examination, part of which will test the candidate's proficiency in the use of the language and the degree may be withheld should there be any linguistic deficiency or should his course work be qualitatively inadequate.

THE Ph.D. DEGREE (French or Spanish)

The Department of Romance Languages offers primary specialization for the doctorate in the following major fields: French language and literature, Spanish language and literature, and Spanish American literature. Secondary fields from which the candidate's work will be selected are as follows: (1) with a major in French language and literature—any other foreign language and literature acceptable to the

department, *or* general linguistics; (2) with a major in Spanish language and literature—Spanish American literature *and* any other foreign language and literature acceptable to the department, *or* Spanish-American literature *and* general linguistics; (3) with a major in Spanish American literature: Spanish literature *and* any other foreign language and literature acceptable to the department, *or* Spanish literature *and* general linguistics. Secondary fields involving course work in other departments are also available in Medieval Studies or Renaissance Studies.

All prospective Ph.D. candidates, regardless of graduate degrees received at UMC or at other institutions, are required to take the Qualifying Examination to determine their fitness for doctoral study. The Qualifying Examination is given four times a year in the months of October, November, February, and March. Doctoral students with the M.A. who enter the department in September will take the examination in November; those who enter in February will take the examination in March; those who enter in June will take the examination in October. Doctoral students without the M.A. who enter the Department in August will take the examination in February; those who enter in February will take the examination in October; those who enter in June will take the examination in November.

The examination will be oral, normally not exceeding one hour in length, and will be designed to reveal (1) the student's knowledge of his major field; (2) his acquaintance with related fields; (3) his oral proficiency in his major language; and (4) his general acumen. If the Committee is satisfied with the student's performance on the examination, they will consider his program of study. If the performance is judged unsatisfactory, the student may repeat the examination at the end of the academic year. The second examination may be, in part, written. Failure of a second examination will terminate doctoral study in this Department. However, in the case of a student with only the bachelor's degree, failure will not prevent his being a candidate for the Master's degree.

Before being admitted to the Comprehensive Examination, a candidate must give satisfactory evidence of his ability to

read two foreign languages *other than* the language of his major. The Advisory Committee will determine which two languages are to be required. Of the two, normally one of them will be the language of his secondary field—French, Italian, Portuguese, or Spanish; the other language may be another one of the four, or German, or Russian.

A student beginning doctoral work will satisfy the departmental Latin requirement as a prerequisite to enrolling in French 411 (Old French) or Spanish 460 (Old Spanish). The Latin requirement must be fulfilled by the end of the first year of graduate study. A candidate for the doctorate in French is required to have some formal training in Old French; a candidate for the doctorate in Spanish must have some formal training in Old Spanish. This requirement must be fulfilled by the end of the second year.

A student teaching 5-7 hours as an assistant in the Department may take 12-14 hours of course work and count one semester of residence requirement for the year's work; for 8-11 hours teaching, 9-11 hours course work and $\frac{3}{4}$ semester; for 12-15 hours teaching, 6-8 hours course work and $\frac{1}{2}$ semester.

The Comprehensive Examination is composed of two sections, one written, the other oral. The written section will consist of four examinations, each lasting a maximum of three hours and at least one of them will be written in the language of specialization. Should these written examinations be judged of sufficiently high quality in content, organization, and language, the candidate will be admitted to the oral section, at least part of which will be conducted in the candidate's language of specialization.

The Final Examination is oral and open to the public and will be largely, though not exclusively, a defense of the dissertation.

GENERAL LINGUISTICS AS A SECONDARY FIELD

A student who has had no previous training in general linguistics will be expected to complete at least 15 hours of work in the field. Additional work in fields other than those mentioned above (e.g.,

History, Philosophy, etc.) may be recommended if the candidate's Advisory Committee feels such courses are essential to round out the student's preparation.

The candidate will be expected, before the end of his second year in residence, to demonstrate proficiency (speaking, reading, writing) in French *and* Spanish. In addition, he must have a good reading knowledge of Latin and of at least one of the following: German, Italian, Portuguese, Russian, or some other language (which need not be of Indo-European origin) acceptable to his advisory committee and to the Graduate School. The two languages used to meet the Departmental language reading requirement may be among those used to fulfill this proficiency requirement.

SOCIAL WORK

JOHN J. O. MOORE, Ed.D., Columbia University.

Director; Director of Graduate Studies; Prof.

CLARA LOUISE MYERS, D.S.W., Washington University. Assoc. Director; Prof.

THOMPSON R. FULTON, A.M., University of Chicago. Prof.

BARRY L. LEVIN, Ph.D., Columbia University. Prof.

MARILYN MADDUX, M.S.W., Washington University. Coordinator of Field Instruction; Asst. Prof.

ARTHUR W. NEBEL, M.A., University of Missouri-Columbia. Prof.

CHARLES F. MITCHELL, A.M., University of Chicago. Assoc. Prof.

WILLIAM NESER, M.S.P.H., University of Missouri-Columbia. Assoc. Prof.

LOUESA DANKS, M.S., Carnegie Institute of Technology. Asst. Prof.

MARY BETH BRINEGAR, M.S.W., Washington University. Asst. Prof.

ELIZABETH A. DUBANSKY, M.S.W., Washington University. Asst. Prof.

WILLIAM LOVATA, M.S.W., St. Louis University. Asst. Prof.

PAUL M. MENGEL, M.S.W., University of Kansas. Asst. Prof.

JOANNE MERMELSTEIN, M.S.S.W., University of Missouri-Columbia. Asst. Prof.

CLOTILDE M. MOLLER, M.A., University of Chicago. Asst. Prof.

DWIGHT W. RIEMAN, M.S.S.W., Western Reserve University. Asst. Prof.

VIRGINIA SOUTHWOOD, M.S.S.W., University of Missouri-Columbia. Asst. Prof.

RHASNEH TIDWELL, M.S.W., St. Louis University. Asst. Prof.

DeVERE R. WHITESELL, M.S.W., Washington University. Asst. Prof.

The School of Social Work offers a graduate program of study leading to a Master of Science in Social Work. Special emphasis is placed on two areas of concentration: the social casework method and the community organization method in social work.

This four-semester professional program integrates community-based practice with classroom instruction. In his first two semesters, the student takes courses in the areas of social welfare policies and services, human behavior and social environment, methods of social work practice, and research. Concurrently he engages in field instruction at one of the agencies in the immediate vicinity. The third semester consists of a block field instruction placement usually away from the Columbia Campus coupled with continued research and a practice seminar. The fourth semester the student returns to the Columbia Campus where he continues with his academic courses and completes his research. No field instruction is required during this last semester.

The School of Social Work maintains educational relationships with hospitals, social agencies, medical centers, correctional institutions, and schools. These settings provide field instruction and opportunities for graduate research for students and faculty. Most books and all journals and periodicals in the social welfare field are in the University of Missouri-Columbia Library. Graduate students are provided with tape recorders for field instruction.

Grants are available from the United States Public Health Service in Psychiatric/Medical Social Work, Services to the Aging, Corrections, Research, U.S. Children's Bureau, and Vocational Rehabilitation Administration, as well as work study programs with the State Division of Welfare, UMC Medical Center, State Division of Mental Diseases, and others. Write the program director for more information.

THE M.S. DEGREE PROGRAM

Admission to this program is limited to those students having a good basic liberal arts education—which normally includes 30 or more semester hours of

social and biological science—and an undergraduate record which indicates a promise of success in graduate study.

The selection of students is based on a combination of the following criteria, no single one of which determines an applicant's acceptance: (1) an undergraduate record of 3.0 or better ($A=4.00$), except by approval of the School, with consideration being given to experience, maturity, major area of study, and other relevant criteria; (2) acceptable performance on a battery of tests designed both to indicate a capacity for graduate work and to indicate a personality suited to working with people in a social welfare situation (these tests may be taken in Columbia without charge to the applicant or at a testing facility more convenient to the individual); (3) a review of application materials including appropriate references.

To complete requirements for the degree, the student must complete 60 hours of graduate credit of which at least 75 per cent should be with grades of *A* or *B*. A minimum of 30 hours should be in full-time enrollment during one academic year at UMC.

There is no language requirement. The 60 hours required should include a minimum of 16 hours credit in field instruction, a minimum of 20 hours credit in 400-level courses, and a minimum of 6 hours research credit to result in a thesis or a research project report.



SOCIOLOGY AND RURAL SOCIOLOGY

- DONALD O. COWGILL, Ph.D., University of Pennsylvania. Chairman, Sociology; Prof.
- ROBERT L. MCNAMARA, Ph.D., Ohio State University. Chairman, Rural Sociology; Prof.
- RALPH E. DAKIN, Ph.D., University of Colorado. Director of Graduate Studies; Prof.
- BRUCE J. BIDDLE, Ph.D., University of Michigan. Prof.
- NOEL P. GIST, Ph.D., Northwestern University. Prof. Emeritus
- ROBERT W. HABENSTEIN, Ph.D., University of Chicago. Prof.
- EDWARD W. HASSINGER, Ph.D., University of Minnesota. Prof.
- DARYL J. HOBBS, Ph.D., Iowa State University. Prof.
- BERNARD M. LAZERWITZ, Ph.D., University of Michigan. Prof.
- HERBERT F. LIONBERGER, Ph.D., University of Missouri-Columbia. Prof.
- HANS O. MAUKSCH, Ph.D., University of Chicago. Prof.
- C. TERENCE PIHLBLAD, Ph.D., University of Missouri-Columbia. Prof. Emeritus
- J. KENNETH BENSON, Ph.D., University of Texas. Assoc. Prof.
- REX R. CAMPBELL, Ph.D., University of Missouri-Columbia. Assoc. Prof.
- JOHN S. HOLIK, Ph.D., University of Missouri-Columbia. Assoc. Prof.
- TOIMI E. KYLLONEN, Ph.D., University of Minnesota. Assoc. Prof.
- JAMES L. MCCARTNEY, Ph.D., University of Minnesota. Assoc. Prof.
- TED R. VAUGHAN, Ph.D., University of Texas. Assoc. Prof.
- ANTHONY G. DWORKIN, Ph.D., Northwestern University. Asst. Prof.
- JOHN F. GALLIHER, Ph.D., University of Indiana. Asst. Prof.
- DONALD GRANBERG, Ph.D., Pennsylvania State University. Asst. Prof.
- JOEL HARTMAN, Ph.D., Pennsylvania State University. Asst. Prof.
- WILLIAM HEFFERNAN, Ph.D., University of Wisconsin. Asst. Prof.
- MARVIN D. LEAVY, Ph.D., Michigan State University. Asst. Prof.
- CHARLES H. MINDEL, Ph.D., University of Illinois-Urbana. Asst. Prof.
- MICHAEL F. NOLAN, Ph.D., Pennsylvania State University. Asst. Prof.
- JAMES R. PINKERTON, Ph.D., University of Wisconsin. Asst. Prof.

The Departments of Sociology and Rural Sociology offer graduate programs leading to the Ph.D., the M.A., and the M.S. de-

grees. A Ph.D., candidate by his choice of adviser and his dissertation topic, chooses to take his degree in General Sociology or in Rural Sociology. The M.S. is offered in Rural Sociology and the M.A. in Sociology. Either Master's degree may be taken on a thesis or a non-thesis plan. Those Master's candidates planning to continue into the Ph.D. program are advised to choose the thesis plan.

Major areas of specialization at the Master's or Doctor's level are in comparative family studies, criminology and deviant behavior, demography, medical sociology, methodology, rural sociology, social organization, social psychology, social theory, and urban sociology.

There are two research and training units organized within the department: the Population Studies Unit and the Comparative Family Studies Center. In addition, the Department is organizationally affiliated with the Center for Research in Social Behavior, the Business and Public Administration Research Center, the Public Opinion Survey Unit, the South Asia Language and Area Center, the School of Medicine, and the Graduate Program in Manpower Training.

The Department maintains a data processing unit within the building, including key punch, verifier, counter-sorter, and a table-top computer. The department also maintains a library of major sociological journals; others are housed in the University of Missouri-Columbia Library.

Sources of student support include Graduate School Fellowships, NDEA and NSF fellowships, Manpower fellowships, U.S. Public Health fellowships, teaching assistantships, and research assistantships.

M.S. AND M.A. REQUIREMENTS

To be admitted to the Master's program, the Department requires at least 12 hours of sociology at the undergraduate level with a grade average of *B* or better and, in addition, at least one course in statistics. The candidate should present acceptable scores on the GRE or the Miller Analogies Test. The GRE is preferred.

The following six courses are required for the Master's degree: Human Ecology (304) or Population Dynamics (305), Social Organization (408) or Social Stratifica-

tion (402), Advanced Social Psychology (343), Advanced Social Statistics (375), Theories of Society (405) or Sociological Theory I (438), and Techniques of Social Investigation (430). The student chooses elective courses in his area of concentration to complete the course requirements. The thesis plan includes 24 semester hours of graduate credit plus 6 hours of thesis credit. The non-thesis plan requires a total of 40 credit hours, at least 28 of which must be in sociology. The thesis is considered a requirement for continuing work towards the Ph.D. degree. There is no language requirement. Other regulations are covered elsewhere in this bulletin.

Ph.D. REQUIREMENTS

Qualifying examinations are administered early in the second semester of the student's work toward the Ph.D.

While there is no set requirement beyond that established by the Graduate School, the typical Ph.D. program in Sociology includes from 40-45 hours of course work beyond the M.A. plus an additional 12 hours of thesis research credit.

After passing the Qualifying Examination and meeting the supplementary skills requirement, but before completing 72 hours of graduate credit hours, the student will be expected to take the Comprehensive Examination. The Comprehensive Examination consists of two parts: a written examination over his major area of study and an examination over the special field of his dissertation.

SPEECH AND DRAMATIC ART

LARRY D. CLARK, Ph.D., University of Illinois.
Chairman; Prof.

FRANCES L. MCCURDY, Ph.D., University of Missouri-Columbia. Director of Graduate Studies; Prof.

CLIFTON CORNWELL, Ph.D., University of Missouri-Columbia. Acting Dean of Faculties; Prof.

JAMES W. GIBSON, Ph.D., Ohio State University.
Prof.

BARTON L. GRIFFITH, Ph.D., University of Michigan. Prof.

LOREN REID, Ph.D., University of Iowa. Prof.

H. DONOVAN RHYNSBURGER, M.F.A., Yale University. Prof.

SAM M. SMILEY, Ph.D., Indiana University. Prof.
THELMA TROMBLY, Ph.D., University of Missouri-Columbia. Prof.

CHARLOTTE G. WELLS, Ph.D., University of Wisconsin. Prof.

LEWIS W. STOECKER, M.F.A., Yale University.
Assoc. Prof.

DONALD G. WILLIAMSON, Ph.D., Michigan State University. Assoc. Prof.

G. JOSEPH WOLFE, Ph.D., University of Iowa.
Assoc. Prof.

JAMES D. AMERMAN, Ph.D., University of Illinois. Asst. Prof.

JOHN A. KLINE, Ph.D., University of Iowa;
Asst. Prof.

GONI MICHAEOFF, Ph.D., Louisiana State University. Asst. Prof.

PAUL E. NELSON, Ph.D., University of Minnesota. Asst. Prof.

SAMUEL D. RICHARDS, Ph.D., University of Southern Illinois. Asst. Prof.

The Department of Speech and Dramatic Art offers graduate study toward M.A. and Ph.D. degrees in each of six Areas: rhetoric, public address, and speech communication; theatre; oral interpretation; speech pathology-audiology; radio-television-film; and speech education. All of the programs are interdisciplinary in the sense that they include work in other departments with related or complementary interests. Master's degree programs prepare students for a variety of careers, depending on the Area in which study is concentrated. Doctoral programs are designed for highly superior students who are interested in college or university teaching or in research.

The Area of Rhetoric, Public Address, and Speech Communication offers opportunities for study and research in the historical, critical, and experimental aspects of speech. Courses from such fields as history, political science, sociology, and psychology contribute to an interdisciplinary approach.

The Area of Theatre stresses broad understanding of principles, theories, and esthetic foundations of theatre along with opportunities for application of talent and knowledge in a wide variety of theatrical productions and in research. Emphasis is on educational theatre and understanding of the function of theatre in modern society.

The Area of Oral Interpretation provides study in the history and theories of the oral performance of literature. Students are encouraged to develop a related field in theatre, literature, or public address.

The Area of Speech Pathology-Audiology offers specialized training for those who wish to qual-

ify as professional workers to provide diagnostic and remedial services for individuals with disorders of communication or who wish to teach at the college or university level. Abundant research materials are available in the Speech and Hearing Clinic and in the other centers with which the Area is affiliated. The master's program in speech pathology is accredited by the American Board of Examiners in Speech Pathology and Audiology.

The Area of Radio-Television-Film provides some technical training in the master's degree program, but emphasizes research on problems of commercial, educational, and instructional broadcasting as they relate to the needs of a changing society. Doctoral programs are individually planned to broaden knowledge in radio-television-film and related fields.

The University of Missouri-Columbia Library is unusually well supplied with research materials related to speech, including special collections on British and American public address and on cleft palate. Of particular interest to students in public address is the Western Historical Manuscripts Division, with its large collection of materials on the Missouri River and Great Plains regions. The library of the State Historical Society of Missouri, located on campus, and the Harry S. Truman Memorial Library, in Independence, are also available for research. A research center within the Department facilitates the pursuit of quantitative studies.

A university theatre, a speech and hearing clinic, and a radio-television-film studio offer opportunities for both research and practice. Students in speech pathology-audiology have additional opportunities for both clinical practicum and research activities through cooperative arrangements with the UMC Medical Center, Mid-Missouri Mental Health Center, Woodhaven Home for Children, and nearby school systems. Students in theatre may gain experience in all aspects of the dramatic arts through participation in the performance schedules of University Theatre, a summer repertory theatre, and Workshop Theatre, a student organization. Readers Theatre and special reading hours are available to students in oral interpretation. An active forensics program is of interest to students in public address. Students in radio-television-film may participate in Alpha Epsilon Rho or Missouri

Broadcasters Association, and students in speech pathology-audiology may become members of the Speech Pathology-Audiology Journal Club, an organization providing contact between the campus and professional persons working in the Mid-Missouri area.

FINANCIAL AIDS

Graduate students in the Department of Speech and Dramatic Art are eligible to apply for Gregory Fellowships, Woodrow Wilson Dissertation Fellowship Grants, EPDA Fellowships, and Work-Study Grants. Forms for application may be obtained from the Department. Other financial aids include:

Graduate Teaching Assistantships: Master's degree required; usual first-year appointment for half-time to permit 12-hour enrollment in graduate studies.

Graduate Research Assistantships: Bachelor's degree required; 40 to 60 hours of work per month during the nine-month academic year.

NDEA Fellowships: open to highly qualified students who intend to make a career of college or university teaching; provides a stipend plus payment of fees; tax exempt. GRE required.

University Graduate Fellowships: GRE required; stipend; tax exempt.

RSA Traineeships: open to students in speech pathology-audiology who intend to work with persons having speech and hearing disorders; \$2,400-2,800 plus payment of fees; tax exempt.

Loans may be made to students in the Area of Speech Pathology-Audiology from the Joann Goodman Gum Memorial Loan Fund. Information may be obtained from the Director of the Area.

Office of Education Fellowships: open to candidates for the master's degree in speech pathology-audiology; \$2,200 plus \$400 for each dependent plus payment of fees; tax exempt.

M.A. REQUIREMENTS

An applicant must present: (1) an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work, with 3.0/4.0 in his major field; (2) GRE verbal and quantitative scores; (3) letters of recommendation, if requested by the Area of Specialization. To be admitted into the degree program with a lower GPA, the student may apply for admission on probation. To be admitted on probation, the student must be sponsored by a member of the professorial staff

of the department, must show promise as a graduate student, and must be recommended by the Committee on Graduate Studies.

The degree of Master of Arts may be completed under either of two plans. Either plan requires a minimum of 30 hours of graduate credit, including Speech 401 and at least 12 additional hours of course work numbered 400 or above. Under Plan A, a student submits a thesis which must be approved by an advisory committee. Under Plan B, no thesis is required. There is no language requirement for the Master's degree.

For the assignment of an adviser, the student should see the Director of the Area in which he wishes to specialize.

Ph.D. REQUIREMENTS

A student who wishes to be accepted for advising at the doctoral level must present: (1) a minimum 3.0 overall grade-point average on his work for the master's degree, (2) GRE scores, (3) letters of recommendation if they are requested by the Area of Specialization.

A student who wishes to be accepted as a candidate for the degree of Doctor of Philosophy must: (1) demonstrate adequate speech, (2) take qualifying examinations during the first semester of registration if he did not complete the master's degree on this campus, (3) obtain the consent of some member of the Department's graduate teaching faculty to serve as his adviser.

To receive the degree of Doctor of Philosophy, the student must: (1) complete a course of study designed in consultation with his advisory committee to expand his knowledge of the field of specialization and to broaden his understanding through acquaintance with related disciplines, (2) complete additional course work and/or pass foreign language examinations to satisfy one of the four options in the Department's Foreign Language-Related Field requirement:

Option I: Demonstrate evidence of ability to translate into English *two* foreign languages by passing the ETS examination if the languages are French, German, Spanish or Russian or by receiving certification of competence from a qualified examiner if other languages are presented or by presenting transcript evidence

of at least 8 semester hours passed with grades of C or better at either the undergraduate or graduate level.

Option II: Demonstrate a high order of competence in *one* foreign language by an additional examination conducted by the language department concerned.

Option III: Demonstrate evidence of ability to translate into English *one* foreign language either by examination or course work (as outlined above) and complete with grades of B or better, at the post-Master's level, 9 semester hours in courses numbered 200 or above from one or more departments outside the Department of Speech and Dramatic Art, that represent a coherent unit of study, either relating to the field of major interest or providing a research tool applicable to that field.

Option IV: Complete with grades of B or better, at the post-Master's level, *two blocks* of course work of 9 semester hours each (in courses numbered 200 or above), each block being from *one or more* departments outside the Department of Speech and Dramatic Art and each representing a coherent unit of study. At least one block of course work must relate to the field of major interest: the other *may* provide a research tool that is applicable to that field.

(3) pass written and oral comprehensive examinations; (4) complete an approved project of independent research culminating in a dissertation that warrants the signatures of the adviser, a second reader within the Department, and a third reader appointed by the Graduate School from outside the Department; (5) defend the dissertation in an oral examination; and (6) comply with all other regulations relating to this degree that may be made by the Graduate School.



STATISTICS

DAVID LEE HANSON, Ph.D., Indiana University.
Chairman; Prof.

FREDERICK WILLIAMS, Ph.D., Northwestern
University. Director of Graduate Studies; Prof.

SHRINIWAS K. KATTI, Ph.D., Iowa State Uni-
versity. Prof.

GARY F. KRAUSE, Ph.D., Virginia Polytechnic
Institute. Prof.

WILLIAM A. THOMPSON, JR., Ph.D., University
of North Carolina. Prof.

GERALD R. CHASE, Ph.D., Stanford University.
Assoc. Prof.

WALLACE E. FRANCK, Ph.D., University of New
Mexico. Assoc. Prof.

JOHN E. HEWETT, Ph.D., University of Iowa.
Assoc. Prof.

JAMES E. HOLSTEIN, Ph.D., University of Iowa.
Assoc. Prof.

ROBERT TSUTAKAWA, Ph.D., University of Chi-
cago. Assoc. Prof.

RICHARD L. DYKSTRA, Ph.D., University of
Iowa. Asst. Prof.

MELVIN L. MOESCHBERGER, Ph.D., North Caro-
lina State University. Asst. Prof.

DAVID A. PIERCE, Ph.D., University of Wiscon-
sin. Asst. Prof. (on leave 1971-72)

The Department of Statistics offers the
Master of Arts and the Ph.D. degrees.

A graduate student may emphasize either
probability or statistics or a combination
of both in his graduate program. The De-
partment maintains contact with people
interested in statistics throughout the uni-
versity through regular Statistics Colloquia.
These colloquia provide an opportunity
for faculty and graduate students to present
the results of their research.

Special facilities in the Department of
Statistics include an open Statistics Labora-
tory which has 33 desk calculators, includ-
ing an electronic desk calculator which can
be programmed. In addition, there are
programmed learning courses in mathe-
matics and statistics available. During the
hours the Laboratory is open, an assistant
on duty will provide instruction in the
use of the equipment.

The Mathematical Sciences Building,
which houses the Departments of Mathe-
matics, Statistics, and Computer Science,
also houses the Computer Center on the
ground floor. The Computer Center has
an IBM Model 65 Computer and related
auxiliary equipment. A large library of
programs and sub-routines is available.
The Mathematical Sciences Building li-

brary has an outstanding collection of books
and journals pertaining to mathematics,
statistics, and computer science, and all
the important books and journals are con-
tinually added to this collection.

Fellowships and teaching and research
assistantships are available to qualified
graduate students. For further information
concerning fellowships and assistantships
write the Director of Graduate Studies,
Department of Statistics.

Admission as a graduate student in Sta-
tistics is open to any student who holds a
baccalaureate degree from an accredited
college and whose record indicates the
likelihood of his successfully completing
a graduate program in statistics. This usual-
ly will imply an undergraduate major in
Statistics or Mathematics, or equivalent
training such as might be obtained in a
degree program in Economics or in one of
the sciences. Consideration is given also
to rank in graduating class, trends in grade
record, maturity and experience, as well
as other criteria bearing on his qualifica-
tions. Ordinarily a student should have
close to a 3.0 average (on a 4.0 scale) in
courses in mathematics and statistics in
order to enter the Master's degree pro-
gram. He should have close to a 3.5 aver-
age in courses in mathematics and statis-
tics in order to become a candidate for
the Ph.D. degree.

The Department of Statistics requires
the Graduate Record Examination verbal
and quantitative aptitude tests. The Grad-
uate Record Examination advanced mathe-
matics test is strongly preferred but not
required.

Prior to entering the graduate program,
the Department prefers a student to have
had a background which includes matrix
theory, calculus and advanced calculus, and
some general courses in statistics. Any
deficiencies must be made up. Required
courses at the 300 level not taken as an
undergraduate may be taken for graduate
credit as part of the graduate program.

Neither a thesis nor a language is re-
quired. The specific requirements are:

- (1) 30 hours of course work numbered 300 or
higher, of which at least 15 hours must
be taken from listings of the Department
of Statistics.
- (2) 15 hours of course work numbered 400 or
higher, of which at least 9 hours must be

taken from listings of the Departments of Statistics and Mathematics.

(3) Mathematics Requirements:

- (a) 302, Elements of Advanced Calculus, and 303, Vector Calculus; or 310 and 311, Advanced Calculus I and II; or 314, Introduction to Analysis; or the equivalent;
- (b) 331, Matrix Theory; or 341, Linear Algebra and Matrices; or the equivalent.

(4) Statistics Requirements:

- (a) 325, Introduction to Probability Theory; or 401, Probability Theory;
- (b) 326 and 403, Statistical Inference I and II;
- (c) The program of a student whose main interest lies in the area of statistics (contrasted with probability theory) generally will include: 307, Non-parametric Statistical Methods; 370, Sampling Techniques; 385, Regression and Correlation Analysis; 395, Analysis of Variance; and 423, Design of Experiments;
- (d) Required courses at the 300 level not taken as an undergraduate may be taken for graduate credit as part of the graduate program.

(5) Comprehensive Examinations.

Except for the above restrictions, there is considerable flexibility. Each student's program must be approved by the Department of Statistics.

The accumulation of nine credit hours with a grade of C or lower on a program for the degree ordinarily will terminate a student's candidacy for the degree Master of Arts. If a graduate student receives 6 hours of C in courses offered by the Department of Statistics during the first two semesters of his degree program, then his candidacy for the M.A. degree will be terminated unless specific action is taken by the Department to the contrary. For each credit hour with a grade of C or lower, except for three credit hours, received in courses offered by the Department of Statistics at the 300 level and above, the student must receive a credit hour with a grade of A in courses offered by the Department at the 300 level and above.

THE Ph.D. DEGREE

Each student must pass a qualifying examination to be admitted to candidacy. At the discretion of the Department, an

examination taken at the time of the M.A. comprehensive examination at UMC may serve as a Ph.D. qualifying examination. Students with Master's degrees from other institutions are required to take a Ph.D. qualifying examination after beginning their graduate work here.

Requirements for the Ph.D. degree in Statistics are determined by the student's advisory committee. There are no specific course requirements other than meeting the requirements as specified in this bulletin.

A dissertation is required and the student must take comprehensive examinations and a final examination as required by the Graduate School.

VETERINARY ANATOMY

JAMES E. BREAZILE, D.V.M., University of Missouri-Columbia; Ph.D., University of Minnesota. Chairman; Director of Graduate Studies; Prof.

ESTHER M. BROWN, M.S., Ph.D., Michigan State University. Prof.

HORST-DIETER DELLMANN, Doc.med.vet., Habil., Universität München; Doc.Vet., Paris-Alfort. Prof.

PHILLIP D. GARRETT, D.V.M., M.S., University of Missouri-Columbia. Asst. Prof.

ROBERT C. MCCLURE, D.V.M., Iowa State University; Ph.D., Cornell University. Prof.

The Department of Veterinary Anatomy offers courses at the graduate level leading to the degree of Master of Science, and in cooperation with the Department of Anatomy of the School of Medicine presents a program of study leading to the degree of Doctor of Philosophy. The course of study in each case is individually arranged.

The courses of study a candidate may pursue are Veterinary Anatomy at the gross, microscopic and ultrastructural levels, comparative neuroanatomy and neurology, embryology and development anatomy, and anatomy of laboratory animals.

The Department has an electron microscope and accessory supporting laboratory equipment, electrophysiological monitoring and recording equipment, experimental surgery equipment, and a giant microtome. The Department has the advantage of the

availability of supporting disciplines on campus such as human anatomy, zoology, psychology, and laboratory animal science in the School of Medicine and the Colleges of Engineering, Agriculture, and Arts and Science.

Consult the department chairman concerning financial aids and degree programs.

MASTER'S PROGRAMS

Admission to the M.S. degree program in Veterinary Anatomy is based upon evaluation of the applicant through correspondence and personal interview to ascertain the motivation and purpose for pursuing the graduate degree. Letters of reference for evaluation of previous attitude and motivation (in either courses of study or work environment) should be submitted, as well as a transcript of previous courses of study. A GPA of 3.0 ($A=4$) is utilized as a minimum guideline requirement, but a major emphasis is placed upon the motivation and prior academic and nonacademic experience of the candidate. At least a B.S. is required, with holders of the D.V.M. degree given preference. No specific requirements of previous courses are set, but an adequate background in biology, chemistry, physics and mathematics is generally expected. All candidates are expected to show high performance on the GRE.

The requirements for a degree in the M.S. program in Veterinary Anatomy vary somewhat depending upon whether the candidate considers the M.S. degree as a terminal degree, or plans to continue for a Ph.D. degree on this campus. All candidates are expected to demonstrate proficiency in neuroanatomy, microscopic, developmental and gross anatomy. If the candidate is anticipating a future in a research area, statistics is recommended, but not required, as most of these candidates in Veterinary Anatomy do continue for the Ph.D. degree which requires a statistics experience.

The student will choose an adviser and with an advisory committee will plan the course of study which will be a minimum of 30 hours beyond the baccalaureate degree and according to the Graduate School regulations. A thesis and final examination are also required.

THE Ph.D. DEGREE REQUIREMENTS

Graduate students entering the Ph.D. degree program in Anatomy through this Department will submit an application containing the following materials: (1) complete transcripts of previous academic record, (2) GRE scores if available, (3) a personal statement from the candidate concerning his reasons and motivation for graduate study in Anatomy, and (4) a copy of the Master's thesis if available. Candidates for admission can strengthen their application by presenting themselves for a personal interview.

Applicants with an accredited Master's degree or professional degree (D.V.M. or M.D.) shall be eligible for consideration for admission to this program, but must complete the basic courses required of all students as soon as possible if these have not yet been completed before admission. These are: general zoology, comparative anatomy, general college chemistry, analytical chemistry, organic chemistry, college physics, college algebra, trigonometry. Completion of the GRE will be required either before or soon after admission.

All candidates must be acceptable to a majority of the members of the staff of this program. As a general rule a *B* average in previous academic work is required for admission. Exceptions must be approved by a majority of the members of the staff. The entire staff shall examine the application material of the candidate and at their discretion he may be asked to take a qualifying examination for admission.

Well-qualified students with a baccalaureate degree whose past academic record shows high scholastic achievement may be admitted to the program with the approval of a majority of the members of the staff.

The following courses are required of all students before completion of a degree program in anatomy: gross anatomy, developmental anatomy, microscopic anatomy and neuroanatomy—all of which may have been taken as part of a professional degree program in an accredited institution and are acceptable—and additionally the following which may be satisfied by earlier work: cell biology, general biochemistry and one course at a graduate level beyond

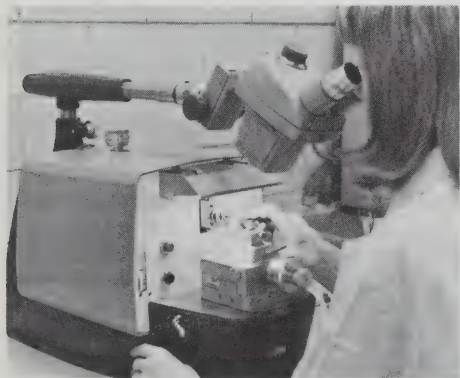
general biochemistry, mammalian physiology and one course at a graduate level beyond mammalian physiology, genetics, and seminar.

The language requirement may be satisfied by showing proficiency in two languages or in one language and one tool such as statistics, electronics, nuclear physics, engineering, or chemistry. The tool will not be a device for circumventing a language, but must be useful in the student's field; the languages should be suitable for the literature in a student's field of interest.

Upon completion of language requirements, collateral field requirements, and a major portion of the course of study outlined by the advisory committee, the candidates will be required to pass a comprehensive examination.

Each candidate will initiate and complete an independent and original research project which is worthy of publication. The results of this research will be presented in the Doctoral dissertation. It will be read and approved by four individuals: the adviser; a second reader from the staff in Anatomy; a third reader appointed by the Graduate School Dean from outside anatomy, but a resident of the University of Missouri-Columbia; and a fourth reader, selected by the candidate's adviser and approved by the committee, who is not a resident of the Columbia Campus, but who is expert in the area of research involved in the dissertation.

Upon completion and acceptance of the dissertation by the four readers, a final examination will be given which will be concerned with support of the dissertation.



VETERINARY MEDICINE AND SURGERY

ROGER E. BROWN, D.V.M., M.S., Michigan State University; Ph.D., Purdue University. Chairman; Prof.

CLARENCE J. BIERSCHWAL, JR., D.V.M., Iowa State University; M.S., University of Missouri-Columbia. Prof.

ARTHUR A. CASE, M.S., D.V.M., Kansas State University. Prof.

E. ALLEN CORLEY, D.V.M., University of Georgia; Ph.D., Colorado State University; Diplomate, Am. College Veterinary Radiology. Prof.

ALLEN W. HAHN, D.V.M., University of Missouri-Columbia; M.S., Ph.D., Drexel Institute of Technology. Director of Graduate Studies; Prof.; Investigator in Space Sciences Research Center.

KEITH L. KRANER, D.V.M., Ohio State University; Diplomate, American College of Laboratory Animal Medicine. Prof.

THOMAS M. EAGLE, D.V.M., Colorado State University. Assoc. Prof.

JAMES E. ENGLISH, JR., D.V.M., Colorado State University; M.S., University of Missouri-Columbia. Assoc. Prof.

RICHARD E. HOFFER, D.V.M., Cornell University; M.S., Auburn University; Diplomate, Am. College of Veterinary Surgeons. Assoc. Prof.

JOSEPH T. MCGINITY, D.V.M., Kansas State University; M.S., University of Missouri-Columbia. Assoc. Prof.

CHARLES E. MARTIN, D.V.M., University of Missouri-Columbia; M.S., Purdue University. Assoc. Prof.

KENNETH H. NIEMEYER, D.V.M., M.S., University of Missouri-Columbia. Assoc. Prof.

JOHN D. RHOADES, D.V.M., University of Missouri-Columbia; M.S., Kansas State University. Assoc. Prof.

LOUIS A. CORWIN, D.V.M., Ph.D., Colorado State University. Asst. Prof.

DONALD W. DEYOUNG, D.V.M., Michigan State University; Ph.D., Colorado State University. Asst. Prof.

ARTHUR W. DOBSON, D.V.M., Iowa State University; M.S., University of Missouri-Columbia. Asst. Prof.

JOHN P. HICKCOX, D.V.M., M.D., University of Missouri-Columbia, Asst. Prof.; Resident, Department Surgery, UMC Medical Center

JAMES S. LARSEN, D.V.M., University of Illinois; M.S., Michigan State University. Asst. Prof.

EDWARD C. MATHER, D.V.M., Iowa State University; M.S., Ph.D., University of Missouri-Columbia. Asst. Prof.

JOSEPH G. MERRIAM, D.V.M., Kansas State University. Asst. Prof.

JOHN B. MULDER, D.V.M., Iowa State University.
Asst. Prof.

LOUIS R. NELSON, D.V.M., Auburn University;
M.S., University of Missouri-Columbia. Asst.
Prof.

CHARLES E. SHORT, D.V.M., Auburn University.
Asst. Prof.

LOUIS G. TRITSCHLER, D.V.M., M.S., University
of Missouri-Columbia. Asst. Prof.

The Department of Veterinary Medicine and Surgery offers graduate work leading to the Master of Science degree and supervision for post-doctoral study and research. The Department joins with relevant departments in staffing and presenting the Area Program in Laboratory Animal Medicine which also offers the Master of Science degree.

The graduate program in the Department of Veterinary Medicine and Surgery can provide advanced training in large and small animal medicine and surgery, anesthesiology, comparative cardiology, ophthalmology, obstetrics and reproduction, radiology and radiation biology, and laboratory animal medicine. A Doctor of Veterinary Medicine degree or its equivalent, as approved by the Department, is a prerequisite for advanced study in Veterinary Medicine and Surgery.

The Department maintains complete medical records on all animals entering the clinic, thus providing a source for comparisons with current clinical materials. Graduate students in the Department have immediate access to the clinic patients, medical records, and facilities of the Veterinary Clinic building to aid them in their chosen area of clinical research. The School of Veterinary Medicine Research Farm has laboratories and space for animal holding. The School of Veterinary Medicine has its own library for the use of those working in this field of interest.

For information and application forms regarding financial assistance, teaching and research assistantships and fellowships, write to the Chairman, Department of Veterinary Medicine and Surgery.

DEGREE REQUIREMENTS

The D.V.M. degree or its equivalent, as approved by the Department, is a prerequisite for advanced study in Veterinary Medicine and Surgery. Performance in the



professional curriculum will greatly influence selection of applicants for graduate study. The applicant must have ranked at least in the upper half of his graduating class. The GRE is required as well.

The professional curriculum completed by the applicant will be compared with that offered at the University of Missouri-Columbia. Should there be obvious deficiencies, especially prerequisites to the chosen area of concentration, the applicant will be asked to strengthen his background. The Graduate School minimums of 30 hours, with not more than 12 of the 30 allowed for research and problems, are standard with this Department.

The planning of the program of study is the responsibility of the student with the aid of an adviser of his choice. Because of the wide range of areas of concentration within the department and the advantages of interchanges offered among them, an advisory committee should be selected within the first semester of study and a definite program accepted. Members of this committee may later be recommended for appointment to the examining committee. The advisory group should consist of the major adviser and other members of the department plus a member from another department within the division and a member from outside the School of Veterinary Medicine. The committee should total four or five in number. Two committee members should be approved as thesis advisers at the Ph.D. level.

A thesis reporting the results of original research and suitable for publication is required of all candidates.

The final examination committee should be of the same make-up as that of the Advisory Committee.

Refer to the regulations governing Master's degrees for additional information regarding procedures.

VETERINARY MICROBIOLOGY

RAYMOND W. LOAN, Ph.D., Purdue University; D.V.M., Washington State University. Chairman; Director of Graduate Studies; Prof.

WILLIAM F. McCULLOCH, M.P.H., University of Minnesota; D.V.M., Iowa State University. Prof.

LESLIE C. MURPHY, D.V.M., Washington State University. Prof.

GEORGE C. SHELTON, Ph.D., University of Minnesota; D.V.M., Texas A&M. Assoc. Dean for Academic Affairs; Prof.

EDWARD R. AMES, Ph.D., D.V.M., Colorado State University. Assoc. Prof.

DONALD C. BLENDEN, M.S., D.V.M., University of Missouri-Columbia. Assoc. Prof.

OLEN R. BROWN, Ph.D., University of Oklahoma. Assoc. Prof.

C. RICHARD DORN, M.P.H., Harvard University; D.V.M., Ohio State University. Assoc. Prof.

EMMETT L. McCUNE, Ph.D., University of Minnesota; D.V.M., University of Missouri-Columbia. Assoc. Prof.

BRUCE D. ROSENQUIST, Ph.D., University of Missouri-Columbia; D.V.M., Iowa State University. Assoc. Prof.

LYOYD A. SELBY, D.P.H., Tulane University; D.V.M., Colorado State University. Assoc. Prof.

ROBERT F. SOLORZANO, Ph.D., Pennsylvania State University. Assoc. Prof.

RONALD F. SPROUSE, Ph.D., University of Oklahoma. Assoc. Prof.

EDMOND R. PRICE, D.V.M., Auburn University. Asst. Prof.

GERALD M. BUENING, Ph.D., D.V.M., Purdue University. Asst. Prof.

PAUL R. SCHNURRENBERGER, M.P.H., University of Pittsburgh; D.V.M., Ohio State University. Clinical Asst. Prof.

The Department of Veterinary Microbiology offers graduate work leading to the degree of Master of Science in Veterinary Microbiology. Advanced study leading to the Ph.D. degree is offered as part of an Area Program in Microbiology. The area program includes selected faculty and educational programs in Veterinary Microbiology, Medical Microbiology, the College

of Agriculture, and the College of Arts and Science.

The program for advanced study in Veterinary Microbiology is designed to prepare veterinarians for teaching and research in veterinary microbiology and in the rapidly expanding biomedical areas. An advisee in the program must have a professional degree or baccalaureate degree in biological or physical science. The program is directed toward the student with a professional degree (D.V.M., M.D. or D.D.S.).

The departmental view of veterinary microbiology is that it is a specialized segment of the Area of Microbiology, one in which the emphasis is more often placed on the relationships of the microbe to its environment than on the organism *per se*. Veterinary microbiology relates closely with host response in complex problems such as autoimmune diseases, infectious diseases, neoplasia, and other current biomedical problems of major importance. Accordingly, graduate programs in veterinary microbiology include course work in biochemistry, genetics, immunology, pathology, physical chemistry, physiology, radiobiology, statistics, ultrastructural morphology, as well as the more classic areas of microbiology such as bacteriology, mycology, parasitology, and virology. Specific areas of concentration available are bacteriology, epidemiology, helminthology, immunology, mycology, parasitology (general), veterinary public health, and virology.

The Department of Veterinary Microbiology cooperates closely with other departments within the School of Veterinary Medicine, as well as other divisions and agencies of the University such as the School of Medicine, Space Sciences Research Center, Nuclear Reactor Research Facility, Environmental Health Center, Sinclair Research Farm (Studies of Ageing), and Wildlife Conservation Commission. Some members of the Department of Veterinary Microbiology have joint appointments in the Departments of Microbiology, Community Health and Medical Practice, Section of Veterinary Diagnostic Services, and others.

Special facilities for research in veterinary microbiology include: (1) Bacteriology and Mycology research laboratories—

Connaway Hall, (2) Parasitology research laboratory—Connaway Hall, (3) Virology research laboratories—Connaway Hall, (4) Veterinary Public Health research laboratory—Veterinary Medical Research Farm, (5) several field laboratories and animal facilities at the Veterinary Medical Research Farm, (6) Veterinary Medical Library; and other library facilities and services on the University of Missouri-Columbia campus. There is a gnotobiotic laboratory with isolators for rearing germfree animals and birds at the Veterinary Medical Research Farm. The virology laboratories are well equipped for studies involving tissue culture and radioisotope techniques.

Most of the support available to students in the Department has come from National Institutes of Health postdoctoral and special fellowships and fellowships from organizations such as the U.S. Air Force and State Health Department. A limited number of stipends are available from general research funds.

THE M.S. DEGREE REQUIREMENTS

Each applicant accepted into the program must be found acceptable by the Adviser, the Department Chairman, and the Director of Graduate Studies. All students must take Part I (general aptitude) of the Graduate Record Examination before entering Graduate School or during the first semester of graduate study. In exceptional cases, students who do not meet the established requirements may be accepted for a one-semester probationary period. The student must attain a *B* average during this semester to continue graduate study. The requirements are: (1) a U.S. citizen with a D.V.M. degree or equivalent must rank scholastically in the upper-half of his graduating class; a veterinarian who is not a U.S. citizen must rank scholastically in the upper-third of his graduating class (where this can be determined) *or* (2) an applicant with a baccalaureate degree only must have attained a minimum GPA of 3.0 ($A=4.0$); in no case may a student with a GPA of less than 2.5 be accepted as a regular student for graduate study.

Under the guidance of an adviser, a program of study is designed to fit the stu-

dent's academic background, experience, and objectives. A student's course of study will include a minimum of 9 credit hours outside the Department of Veterinary Microbiology, including one course in biochemistry or biostatistics (300 or 400 level). This latter requirement may be waived for those students who present evidence of satisfactory completion of an equivalent course from another institution. The program of study must meet all requirements of the Graduate School. Courses may be selected from a list of suggested courses available from the Director of Graduate Studies and from this bulletin. Teaching assignments will be made with due regard to special interests and the total program of study.

Upon satisfactory completion of the prescribed course work and thesis, the appointment of a Final Examination Committee is requested from the Dean of the Graduate School. This committee should include at least one member of the Area of Microbiology and one faculty member outside the Department of Veterinary Microbiology.

VETERINARY PATHOLOGY

DONALD A. SCHMIDT, D.V.M., Ph.D., Michigan State University. Chairman; Director of Graduate Studies; Prof.

LOREN D. KINTNER, D.V.M., M.S., University of Missouri-Columbia. Prof.

LAWRENCE G. MOREHOUSE, D.V.M., Ph.D., Purdue University. Prof.

DONALD B. RODABAUGH, D.V.M., M.S., University of Missouri-Columbia. Prof.

HARRY H. BERRIER, D.V.M., M.S., University of Missouri-Columbia. Assoc. Prof.

RUSSELL V. BROWN, Ph.D., Iowa State University. Assoc. Prof.

CHARLES C. MIDDLETON, D.V.M., M.S., Michigan State University. Assoc. Prof.

BONNARD L. MOSELEY, D.V.M., M.S., University of Missouri-Columbia. Assoc. Prof.

STUART L. NELSON, D.V.M., Ph.D., Purdue University. Assoc. Prof.

LEROY D. OLSON, D.V.M., Ph.D., Purdue University. Assoc. Prof.

JOSEPH E. WAGNER, D.V.M., Ph.D., University of Illinois. Assoc. Prof.

PATRICK J. MANNING, D.V.M., University of Minnesota. Asst. Prof.

The Department of Veterinary Pathology of the School of Veterinary Medicine offers graduate work leading to the Master of Science in Veterinary Pathology. The Department also cooperates with the Department of Pathology of the School of Medicine and the Department of Plant Pathology of the College of Agriculture in offering a Ph.D. program in Pathology. The information on that program is presented in the section on Area Programs.

The laboratories and equipment described in the area program in pathology will generally be available for M.S. candidates. The fields of study as presented there are applicable to the departmental program.

Write the Director of Graduate Studies of the Department for details and application forms for assistantships and fellowships.

THE M.S. DEGREE PROGRAM

To be considered for admission to the Master of Science program in Veterinary Pathology, the applicant should have completed the D.V.M. degree or an acceptable baccalaureate degree. The latter would include subject courses in anatomy, microbiology, physiology, biochemistry, and pathology, or their equivalents. An advisory committee of three faculty members will be established during the first semester to assist in formulating a plan of study and advising the student on thesis research.

An applicant must take Part I (General Aptitude) of the GRE before entering Graduate School or during the first semester of graduate study. A student should be in the upper one-third of his graduating class, or he may be admitted on probationary status for one semester.

There is no language requirement. To satisfy requirements for the M.S., a student must complete a minimum of 30 hours selected from courses receiving graduate credit, with 15 or more hours in 400-level courses. Sixteen credit hours must be taken in pathology courses other than 490. A minor is not required, but if chosen, must be approved by the professor of the minor subject and will be included in the final examination.

An acceptable thesis based upon original research is required of all M.S. degree can-

didates. A final examination is also required and will be chiefly a defense of the thesis. It is possible for a student to transfer to the Ph.D. Program without completing the M.S. degree requirements. Regulations governing this transfer are available from the Director of Graduate Studies.

See also the regulations governing the Master's degree as set by the Graduate School and presented elsewhere in this bulletin.

VETERINARY PHYSIOLOGY AND PHARMACOLOGY

TERRENCE M. CURTIN, D.V.M., Ph.D., Purdue University. Chairman; Prof.

HOMER E. DALE, D.V.M., Ph.D., University of Missouri-Columbia. Director of Graduate Studies; Prof.

SAUL D. LARKS, Ph.D., University of California. Prof.

ROBERT H. SCHIFFMAN, Ph.D., Michigan State University. Prof.

FRANK E. SOUTH, Ph.D., University of California-Berkeley. Prof.

MYRON E. TUMBLESON, Ph.D., University of Minnesota. Assoc. Prof.

CHARLES R. SHORT, D.V.M., Ph.D., University of Missouri-Columbia. Assoc. Prof.

RICHARD E. DOYLE, D.V.M., M.S., University of Florida. Asst. Prof.

DAVID P. HUTCHESON, Ph.D., University of Missouri-Columbia. Asst. Prof.

WILLIAM P. PALMORE, D.V.M., Ph.D., Yale University. Asst. Prof.

DUDLEY B. SISK, D.V.M., Ph.D., Purdue University. Asst. Prof.

D. JESSE WAGSTAFF, D.V.M., Ph.D., Utah State University. Asst. Prof.

The Department of Veterinary Physiology and Pharmacology offers graduate study leading to the degree Master of Science in three disciplines: Veterinary Biochemistry and Nutrition, Veterinary Pharmacology, and Veterinary Physiology. Graduate study leading to the Doctor of Philosophy degree can be accomplished in the Department under the auspices of various Area Programs. In all cases, the program of study leading to a graduate degree is individually arranged, and prospective students are encouraged to correspond directly with the Department Chairman about the opportunities which are available.

In addition to the general standards identified by the Graduate School, the Department requires that prospective graduate students meet the following minimal standards for admission to the program: (1) a GPA of 3.0 ($A=4$) in the undergraduate program, or rank in the upper 33 per cent of the graduating class; (2) a minimum of 10 hours of course work in biology with at least one course in zoology, and a minimum of 10 hours of course work in chemistry which must include both inorganic and organic chemistry; and (3) a minimum of 5 semester hours of course work in college physics, and a minimum of 5 semester hours of course work in college mathematics which must include college algebra. Lack of such a background in mathematics and physics does not exclude a student from the program; however, it does necessitate remedial course work which must be accomplished without graduate credit.

BIOCHEMISTRY AND NUTRITION

This section seeks to provide an opportunity for graduate veterinarians and those with similar training to study in areas unique to their needs. The program is oriented towards study of the whole animal and especially toward applied investigative and clinical aspects.

The precise course of study is determined by the interests and needs of the student, but in all cases the minimal requirements for the M.S. degree are: Physiological Chemistry (6 hours—either Agricultural Chemistry 280 and 303; Biochemistry 304 and 305; or equivalent), Organic Qualitative Chemistry (Chemistry 325 or the equivalent, 3 hours), Statistics (6 hours), Research (5-8 hours to culminate in a thesis), and Electives in courses numbered 400 or above (8-11 hours with a minimum of 5 hours in biochemistry or physiology).

Research activities can be chosen from such areas as: interactions between nutrition and disease, effects of stress or disease on metabolism, reproductive biochemistry, and other problems related to study of biochemistry and nutrition in veterinary medicine.

Facilities for research are available at the Sinclair Farm. This farm is chiefly devoted to comparative gerontology. A twelve-channel Technicon automated blood chemistry apparatus and other instruments of research precision are under the supervision of this section at the Sinclair Farm. Department facilities are also located at the Veterinary Research Farm and the Veterinary Physiological Sciences building. Such instrumentation should adequately serve the needs of research projects at the Master's level.

Work for the Ph.D. degree in biochemistry and nutrition can be accomplished in the Department under the authority of the Area Program in Nutrition described elsewhere in this bulletin.

VETERINARY PHARMACOLOGY

In this section, graduate study is designed to provide a basis for the understanding of the fundamental principles of pharmacology. Planning of the program shall be the responsibility of the student and his adviser. The following courses (or their transferable equivalent) are required of all candidates for the M.S. degree: Statistics 207 (3 hours), General Pharmacology 330 (lecture, 3 hours), General Pharmacology 330 (lecture, 3 hours), General Pharmacology 332 (laboratory, 2 hours), Physiological Chemistry (6 hours—either Agricultural Chemistry 280 and 303; Biochemistry 304 and 305; or equivalent of these courses), Mathematics 205 (3 hours), Pharmacology 400-level courses in the area of the student's research interest (3-5 hours), Pharmacology Seminar 410 (2 hours), and Veterinary Pharmacology Research 490 (8-10 hours).

Instrumentation and laboratory space for pharmacological investigations are provided at the Veterinary Research Farm. Emphasis is upon comparative pharmacology and students may choose to work on any of several different research projects. A thesis resulting from an original investigation in the student's area of interest is required.

A program leading to the Ph.D. degree in Pharmacology is available to graduate students with suitable qualifications. The

degree is granted in cooperation with the Department of Pharmacology in the School of Medicine; candidates should consult individually about the opportunities and requirements for such a program.

VETERINARY PHYSIOLOGY

This section is concerned with knowledge of normal functions in domestic animals. Graduate study provides an opportunity to survey this knowledge and to become familiar with research in the field.

The specific program of study for the M.S. degree will vary somewhat depending on the background and interests of the student, and before enrolling for any course work the student should discuss this matter in depth with his major professor. However, despite the individual variation, the program of each student must include the following: physiology (15 hours), physiological chemistry (6 hours—either Agricultural Chemistry 280 and 303; Biochemistry 304 and 305; or equivalent courses), statistics (3 hours), and Selected Topics in Analysis—Math 205 (3 hours).

The intent of these requirements is to insure significant and broad exposure to the field of physiology; it is not the intent to provide highly specialized training in one particular aspect of the field. Such highly specialized training is often a requirement for a graduate degree, but that training must supplement, rather than substitute, for the more general requirement.

Each student is expected to submit a thesis reporting experimental physiological investigations conducted during the degree program. For this purpose the Department has a variety of equipment and facilities. Of considerably more relevance, however, is the availability and competence of departmental faculty to direct graduate study in the various aspects of physiology. Because both the number and research interests of departmental faculty do change, prospective students are advised to explore in depth any proposed program.

Work for the Ph.D. degree in Veterinary Physiology can be accomplished in the Department under the auspices of the Area Program in Physiology which is described elsewhere in this bulletin.

Area Programs

Ancient Studies
Black Studies
Business Administration
Computer Science
Environmental Sciences
Laboratory Animal Medicine
Linguistics
Medieval and Renaissance Studies
Microbiology
Nuclear Engineering
Nutrition
Pathology
Physiology
Sanitary Science
South Asia Language



Area Programs

ANCIENT STUDIES AREA

ROBERT J. ROWLAND JR., Ph.D., University of Pennsylvania. Chairman; Assoc. Prof. of History and of Classical Studies

WILLIAM R. BIEBS, Ph.D., University of Pennsylvania. Asst. Prof. of Art History & Archaeology

WILLIAM B. BONDESON, Ph.D., University of Chicago. Assoc. Prof. of Philosophy

MARIE FARNSWORTH, Ph.D., University of Chicago. Visiting Prof. of Art History & Archaeology

PETER P. KAHANE, Ph.D., University of Basel. Visiting Prof. of Art History & Archaeology

CLAUDIA KREN, Ph.D., University of Wisconsin. Assoc. Prof. of History

EUGENE N. LANE, Ph.D., Yale University. Assoc. Prof. of Classical Studies

J.A.O. LARSEN, Ph.D., D. Litt., Harvard University. Visiting Prof. of History

FORDYCE MITCHEL, Ph.D., Yale University. Prof. of History

MEYER REINHOLD, Ph.D., Columbia University. Prof. of Classical Studies

RALPH M. ROWLETT, Ph.D., Harvard University. Assoc. Prof. of Anthropology

CHARLES F. SAYLOR, Ph.D., University of California, Berkeley. Assoc. Prof. of Classical Studies

THEODORE A. TARKOW, Ph.D. Candidate, University of Michigan. Asst. Prof. of Classical Studies

JOHN C. THIBAUT, Ph.D., University of Illinois. Prof. of Classical Studies

HOMER L. THOMAS, Ph.D., University of Edinburgh. Prof. of Art History & Archaeology

SAUL S. WEINBERG, Ph.D., Johns Hopkins University. Prof. of Art History & Archaeology

The Ancient Studies program at the University of Missouri-Columbia is an interdisciplinary program in Anthropology, Art History and Archaeology, Classical Studies, History, and Philosophy, offering a minor for both the M.A. and Ph.D. degrees. A student who pursues his graduate degree in one of the participating departments is eligible to work for the minor in Ancient Studies. To be part of the program, he must make formal application to the Chairman. If accepted, he must satisfy the following requirements:

(1) For a Master's degree with a minor in Ancient Studies, a student must take at least 10, but no more than 12 hours of approved course work in at least two of the related departments other than his major department.

(2) For a Ph.D. degree with a minor in Ancient Studies, a student must take at least 24 hours of approved course work in all three of the related departments other than his major department. Further, as part of these 24 hours, he must take at least one course at the 400 level in each of two separate related departments.

BLACK STUDIES AREA

ARVARH E. STRICKLAND, Ph.D., University of Illinois. Coordinator; Prof. of History.

An individual program of specialization in Black Studies may be arranged within the framework of a conventional graduate degree in any one of several fields. The options within a regular degree program are employed to include maximum exposure to courses emphasizing the Afro-American background and experience. Courses outside the major department, but in related fields, are incorporated into the student's study plan.

Students interested in pursuing a Black Studies specialty within their chosen field should consult a departmental adviser designated to assist in this matter. In the absence of other information, the student should contact the Coordinator of Black Studies through the Graduate School.

BUSINESS ADMINISTRATION

EARL F. LUNDGREN, Ph.D., University of Wisconsin. Director of Ph.D. Program in Management; Assoc. Prof. of Management.

FRANCIS L. STUBBS, Ph.D., University of Wisconsin. Director of MBA Programs; Prof. of Finance

DAVID A. WEST, Ph.D., University of Arkansas. Chairman of the Department of Finance; Director of Ph.D. Program in Finance; Prof. of Finance

CARL E. BLOCK, Ph.D., University of Iowa. Chairman of the Department of Marketing; Director of Ph.D. Program in Marketing; Assoc. Prof. of Marketing

The degrees of Master of Business Administration and Doctor of Philosophy are joint offerings of the Department of Finance, the Department of Management, and the Department of Marketing.

The information presented here is common to the three departments, i.e., program descriptions, and requirements for admission and for completing degrees. *Please refer to the entries of the respective departments for their faculty listings, particular information, assistantship offerings, etc.* The student should refer also to the Graduate School regulations given elsewhere in this bulletin.

The program leading to the M.B.A. degree is a professional program designed for superior graduate students who wish to prepare themselves for managerial careers in business and industry. At the same time, it provides a strong educational background for persons who plan to continue their academic training in preparation for teaching and research careers in business administration.

There is emphasis on the broad problems confronting administrators of business enterprise, mastery with the tools of analysis, and cultivation of the judgment required for competent management. The M.B.A. program encourages a broad perspective of the business world and an awareness of the economic, social, and political problems related to the operation of private enterprise. Although major emphasis is placed on the essential unity and interrelations of all business operations, there is provision for a modest concentration in one area of work.

The Doctor of Philosophy degree prepares students for college teaching and develops competence for research in a specialized field of either finance, management, or marketing.

The candidate for the Ph.D. receives three basic types of graduate education:

1. He obtains a broad knowledge of the major areas of business, the problems found in these areas, and the interrelationship among these problems. This background enables the candidate to develop an understanding of the major responsibilities of the executive in his role as analyst, planner, and decision-maker.
2. A candidate develops a specialized field in which he acquires an extensive knowledge and understanding. Normally, this field is the one in which the student will ultimately teach.
3. The candidate develops and demonstrates his capacity to do competent and original

research by submission of an acceptable dissertation.

A modern air-conditioned building houses the School of Business and Public Administration and the B&PA Research Center. Computer facilities include an IBM System 360-65. The library contains more than one and one-half million volumes and 6,000 periodicals in the field.

A limited number of graduate scholarships, fellowships, research assistantships, and teaching assistantships are available. Stipends vary, but range up to \$2,500 for M.B.A. candidates. In the case of Ph.D. candidates, stipends range to \$3,900 for half-time duties for nine months.

Additional information with respect to the M.B.A. program or the Ph.D. Program and with respect to fellowships can be obtained from the appropriate program director listed above, School of Business and Public Administration, University of Missouri-Columbia.

THE M.B.A. DEGREE

This program is open to students who hold a baccalaureate degree from an accredited school and meet the entrance requirements established for graduate study in business irrespective of the field in which the student achieved his undergraduate degree. Admission to the program is dependent primarily upon quality of undergraduate work and a satisfactory score on the Admission Test for Graduate Study in Business, administered by the Educational Testing Service, Princeton, New Jersey. A foreign student whose native language is not English is required to present an acceptable score on the Test of English as a Foreign Language, also administered by the Educational Testing Service.

The first year consists of a series of "graduate core courses"; these courses draw upon subject matter normally covered in undergraduate courses in business. The scope and method of coverage is more demanding and is directed toward the maturity of the graduate student. A "core course" may be waived for a student whose undergraduate record indicates that he has successfully completed courses covering substantially the same materials. In addition, it is assumed that the student has fundamental training in the analysis

branches of mathematics, equivalent to Mathematics 205, and an advanced course in the behavioral sciences.

The first year program totals 29 hours of work in nine courses: Accounting 326, 327; Economics 302, 303; Management 301, 304, 361; Marketing 302; and Finance 303. Students holding undergraduate degrees in schools of business, or having completed comparable course work in other institutions with acceptable grades, can expect waiver of much or all of the first-year program. It is possible to satisfy the requirements for the M.B.A. degree in two semesters by following the second-year program of 30 hours.

The second-year program requires 30 hours of work, 24 hours of which must be at the 400 level. Two 400-level courses required of all students in the second-year program are Business and Public Policy, and Business Policy and Decision Making.

Each student must complete two advanced courses (numbered above 400) in an "area of concentration" and one advanced course (400 level) in each of three additional areas. The areas are:

Business Finance	Marketing
Controllership	Quantitative Analysis for Business
Economics	Personnel Management and Industrial Relations
Health Services Management	Risk Management
Industrial and Production Management	

The second-year program must include a total of at least six hours of advanced work in the "operational" fields of business: Business Finance, Industrial and Production Management, Marketing, and/or Personnel Management and Industrial Relations. In no case shall the second-year program include more than 12 hours beyond the core courses in any one subject area. Electives shall normally be chosen from 400-level courses in the following areas:

Accounting	Mathematics related to business
Behavioral Science courses relating to business	Personnel Management and Industrial Relations
Business Finance	Risk Management
Economics	Social Control of Business
Industrial and Production Management	Statistics
Marketing	

Written comprehensive examinations are given in the final semester covering the student's graduate work. The M.B.A. pro-

gram does not require a thesis or language. However, some of the first-year courses and a majority of the second-year courses place heavy emphasis on independent reading, modest research assignments, and analytical reports. Each student will conform to the residence and other requirements specified by the Graduate School.

THE Ph.D. DEGREE

Candidates in the Ph.D. Program are required to have basic preparation in finance, management, marketing, and certain supporting disciplines. An area of concentration and two supporting areas must be designated. In addition to finance, management, and marketing, the supporting areas include—but are not limited to—accounting, economics, sociology, and statistics. The program is constructed to meet the candidate's interests through consultation with his adviser.

Admission to the Ph.D. in Business Administration program is limited to students who hold a baccalaureate degree from an accredited institution and who have achieved an outstanding undergraduate record. Students may begin study in the fall, winter, or summer. Before admission to candidacy for the Ph.D. in Business Administration, a student must be admitted to the Graduate School and be accepted by the Department of Finance, Management, or Marketing. Tentative departmental acceptance is based upon a combination of: (1) above-average performance in a minimum of 30 hours of work at the graduate level, (2) superior performance on the Admission Test for Graduate Study in Business, and (3) letters of recommendation. Completed research and/or publications may also be considered.

A student may be permitted to commence work upon a Ph.D. program without first being accepted for a Master's program. Most students, however, will complete the requirements for a Master's program and then apply for admission to the Ph.D. program. A student is formally accepted for a Ph.D. program at the time he is admitted to candidacy, which usually occurs in the first year of graduate work after a Master's program and after satisfactory performance on the Ph.D. qualifying examination.

To satisfy requirements for the Ph.D. degree, a candidate must complete a study program approved by the student's advisory committee. This program must include a minimum of 54 hours of graduate work, including work on a Master's degree; at least one 400-level course in Finance, in Management, and in Marketing; and one 400-level course in research methodology.

The candidate will designate an area of concentration, which will consist of at least 15 hours of work acceptable for graduate credit in either Finance, Management, or Marketing, and will select two supporting areas related to his area of concentration. Each supporting area must be approved by the Advisory Committee and shall consist of at least 12 hours of work acceptable for graduate credit. One of the two supporting areas normally will be outside the areas of finance, management, and marketing.

Before being admitted to the comprehensive examination, a candidate must meet the language-collateral field requirements. Candidates may elect one of five options: competence in two foreign languages or in two collateral fields, or competence in one foreign language and one collateral field, or a high order of ability in one language or in one collateral field. Many candidates are encouraged to present collateral fields instead of exercising the language option. The comprehensive examination covers the area of concentration and two supporting areas.

A doctoral dissertation, for which a student earns up to 24 hours of credit, is required. It must be written on a topic related to his area of concentration and approved by the Comprehensive Examining Committee. The dissertation is viewed as a constructive experience rather than a test of the candidate's endurance.

While enrolled for 490 Research credit, the candidate will be expected to attend all doctoral dissertation seminars. The candidate's dissertation proposal shall be presented formally before one such seminar, and he will be asked to report progress at other seminars.

The oral final examination covers the research involved in writing the dissertation.

COMPUTER SCIENCE

PAUL BLACKWELL, Ph.D., Syracuse University.
Chairman; Assoc. Prof.

SRISAKDI CHARMONMAN, Ph.D., Georgia Institute of Technology. Director of Graduate Studies; Assoc. Prof.

COLEMAN BURTON, B.A., Cornell University.
Instr.; Associate Director of Computational Services Center.

ROBERT L. CAUSEY, Ph.D., Stanford University.
Assoc. Prof.

DONALD R. SHURTLEFF, Ph.D., Worcester Polytechnic Institute. Prof. of Computer Science; Prof. of Information Science; Director of Computational Services Center.

GORDON K. SPRINGER, Ph.D., Pennsylvania State University. Asst. Prof.

The Computer Science Department offers a program leading to a degree of Master of Science in Applied Mathematics (Computer Science) or a Master of Science in Electrical Engineering (Computer Science).

ENVIRONMENTAL SCIENCES AREA

STANLEY N. DAVIS, Ph.D., Yale University.
Chairman; Prof. of Geology

The University of Missouri-Columbia has recently initiated an interdisciplinary Environmental Sciences Studies program. Students participating in the program will receive a degree in an existing department and must fulfill the requirements of that department. In addition, courses acceptable to the Environmental Sciences Graduate Faculty must be taken outside the department and the student's research program and dissertation, where required, must be approved by the Environmental Sciences Graduate Faculty.

LABORATORY ANIMAL MEDICINE AREA PROGRAM

CHARLES C. MIDDLETON, D.V.M., University of Missouri-Columbia. Chairman; Assoc. Prof. of Veterinary Pathology and Community Health and Medical Practice

RICHARD E. DOYLE, D.V.M., University of Missouri-Columbia. Director of Graduate Studies; Asst. Prof. of Veterinary Physiology and Pharmacology

JOSEPH E. WAGNER, Ph.D., University of Illinois. D.V.M., Iowa State University. Assoc. Prof. of Veterinary Pathology
 KEITH L. KRANER, D.V.M., Ohio State University. Prof. of Veterinary Medicine and Surgery
 PATRICK J. MANNING, D.V.M., University of Minnesota. Asst. Prof. of Veterinary Pathology
 LOUIS A. CORWIN, Ph.D., D.V.M., Colorado State University. Asst. Prof. of Veterinary Medicine and Surgery
 DONALD C. BLENDON, D.V.M., University of Missouri-Columbia. Assoc. Prof. of Veterinary Microbiology and Community Health and Medical Practice
 ROBERT F. SOLORZANO, Ph.D., Pennsylvania State University. Assoc. Prof. of Veterinary Microbiology
 RICHARD E. HOFFER, D.V.M., Cornell University. Assoc. Prof. of Veterinary Medicine and Surgery
 JOHN B. MULDER, D.V.M., Iowa State University. Asst. Prof. of Veterinary Medicine and Surgery

The Graduate Area Program in Laboratory Animal Medicine provides training leading toward a Master of Science degree in Laboratory Animal Medicine. The committee and faculty perceive Laboratory Animal Medicine as a specialty of Veterinary Medicine concerned with experimental animals and their use in biological research.

Careers in Laboratory Animal Medicine generally fall into one of three categories: professional care and management of research animal colonies; administration and teaching; or basic research in identifying and defining animal models that can be used to study human health problems. This graduate program is designed to provide training in such depth and breadth that graduates can assume positions of senior responsibility in any of these career areas.

The resources of the Medical Center, School of Veterinary Medicine, and Sinclair Research Farm will be principally utilized in this program of graduate education; however, other resources such as the Nuclear Reactor Facility and Space Sciences Research Center may be utilized.

In addition to the main UMC Library, the libraries of the Medical and Veterinary schools provide ready access to an outstanding selection of reference texts and periodicals. The Department of Laboratory Animal Medicine in the Medical Center has a highly specialized library, particularly pertinent to laboratory animal medicine,

which is available to graduate students in this area program.

Students are encouraged to select any biologic area of their choice (for example, pathology, zoology, genetics, physiology, surgery, anatomy, etc.) to pursue in depth and to use for their thesis research. An appropriate faculty member in the chosen area will be selected, with committee approval, to serve as thesis adviser.

A training grant is now being used to support this program. It includes a limited number of trainee stipends for which selections are made by the Laboratory Animal Medicine Area Executive Committee on a best-qualified basis. In addition, the National Institutes of Health provides individual postdoctoral fellowships to qualified individuals seeking training in the field of Laboratory Animal Medicine.

PROGRAM REQUIREMENTS

The Laboratory Animal Medicine Area Executive Committee will make selections of graduate students for acceptance into the area program. All trainees must have a degree of Doctor of Veterinary Medicine or its equivalent, and meet the general requirements of the Graduate School for admission to a Master of Science degree program.

The training program in Laboratory Animal Medicine leading toward a Master of Science degree includes specified and elective course work, residency training, and research. An acceptable master's thesis based upon original research is required. These requirements are in addition to the general requirements of the Graduate School. In most cases it is anticipated that three years will be required to complete this program; however, a shorter period may be approved by the committee in instances where a trainee has had special experience or demonstrates exceptional progress.

Required formal courses will include 22 semester hours of specified Laboratory Animal Medicine courses, and a course in statistics relative to biology. Additional elective courses may be required depending upon the area chosen for thesis research.

The residency of this program will consist of approximately 20 hours per week of applicatory training in an assigned area.

Three areas are utilized for the residency training and each postdoctoral fellow will rotate at four-month intervals throughout these areas during the first year of his training. The areas include: the Department of Laboratory Animal Medicine, Sinclair Research Farm, and the Research Animal Diagnostic Laboratory.

LINGUISTICS AREA PROGRAM

DANIEL E. GULSTAD, Ph.D., University of Illinois. Chairman; Asst. Prof. of Spanish.

JOHN M. HOWIE, Ph.D., Indiana University. Director of Graduate Studies; Asst. Prof. of French and Linguistics.

THELMA TROMBLY, Ph.D., University of Missouri-Columbia. Director of Graduate Studies; Prof. of Speech and Dramatic Art

EUGENE N. LANE, Ph.D., Yale University. Assoc. Prof. of Classical Languages

DANIEL G. HAYS, Ph.D., University of Missouri-Columbia. Asst. Prof. of Psychology

DONALD M. LANCE, Ph.D., University of Texas. Asst. Prof. of English

BEN F. NELMS, Ph.D., University of Iowa. Asst. Prof. of Education and English

OLGA C. SHOPAY, Ph.D., Ohio State University. Asst. Prof. of Germanic and Slavic Languages

TERRY D. TENBRINK, Ph.D., Michigan State University. Asst. Prof. of Education

DON R. VESPER, Ph.D., University of Chicago. Asst. Prof. of Linguistics and Romance Languages

RODNEY F. MOAG, Ph.D. Candidate, University of Wisconsin. Instructor in South Asian Languages and Literature

PREM SINGH, Ph.D. Candidate, Cornell University. Instructor in South Asian Languages and Literature

The Linguistics Area Program offers interdisciplinary work leading to a Master of Arts in Linguistics. The program is jointly staffed by faculty from the Departments of Classical Languages, Germanic and Slavic Languages, Romance Languages, English, Speech, Anthropology, and Psychology. In addition, the South Asia Studies Program and the Center for Research in Social Behavior participate in the linguistics program. Areas of concentration may include not only Linguistics, but also Linguistics combined with languages, English or Education and English, Speech, Anthropology, or South Asian Area.

A Kay sonograph is available to perform spectrographic analyses of speech.

Financial aid is generally arranged through the participating departments. Write the Chairman, Committee on Linguistics, Arts and Science Building, for further information on the program.

THE MASTER'S PROGRAM

To be accepted as an M.A. candidate, a student must fulfill the Graduate School admission requirements, and have taken Linguistics survey courses 371 and 372 or make up course deficits by non-credit graduate work. Admission to the program is contingent upon recommendation of the Linguistics faculty. An adviser with appropriate academic interests will be selected from the Linguistics staff to aid the candidate in planning his program. All M.A. candidates must complete with grades of B or better a core program of four courses: Phonology, Advanced Phonology, Syntax, and Advanced Syntax. The courses to complete degree requirements are selected by the student under the guidance of his adviser.

Foreign languages are not required but are normally included in a linguistics program; these needs are determined on an individual basis.

A candidate has an option of two programs of study: 24 hours of course work plus a 6-credit-hour research project, or 30 credit hours of course work. In either, a student must take 15 hours of 400-level course work and not more than 12 hours in readings and research. Up to 6 hours may be taken in a minor area. Either plan culminates in a two-part final: a four-hour written portion to be followed within a week by an hour-long oral portion. The candidate on the thesis program must pass a research project examination, either written or oral, covering the project and related topics.

MEDIEVAL AND RENAISSANCE AREA STUDIES

DONALD K. ANDERSON, JR., Ph.D., Duke University. Prof. of English

EDZARD BAUMANN, Ph.D., Vienna. Assoc. Prof. of Art History

ANTHONY C. DEBELLIS, M.A., Ohio State University. Instr. in Italian

ROBERT M. BENDER, Ph.D., University of Michigan. Assoc. Prof. of English

WILLIAM B. BONDESON, Ph.D., University of Chicago. Assoc. Prof. of Philosophy

THOMAS D. COOKE, Ph.D., University of Pittsburgh. Asst. Prof. of English

MILTON MCC. GATCH, Ph.D., Yale University. Assoc. Prof. of English

RUSSELL V. GIFFIN, Ph.D., Ohio State University. Assoc. Prof. of French and Italian

DANIEL E. GULSTAD, Ph.D., University of Illinois. Asst. Prof. of Spanish

JAMES V. HOLLERAN, Ph.D., Louisiana State University. Assoc. Prof. of English

BEN L. HONEYCUTT, Ph.D., Ohio State University. Asst. Prof. of French

HAROLD G. JONES, Ph.D., Princeton University. Asst. Prof. of Romance Languages

WILLIAM M. JONES, Ph.D., Northwestern University. Prof. of English

CLAUDIA KREN, Ph.D., University of Wisconsin. Assoc. Prof. of History

HELLMUT LEHMANN-HAUPT, Ph.D., University of Frankfurt. Prof. of Library Science

EBION DE LIMA, Ph.D., Pontifical University of Sao Paulo. Instr. in Italian

HOWARD T. MANCING, Ph.D., University of Florida. Asst. Prof. of Spanish

ANDREW C. MINOR, Ph.D., University of Michigan. Assoc. Dean of the Graduate School; Prof. of Music History

BONNER MITCHELL, Ph.D., Ohio State University. Prof. of French and Italian

CHARLES F. MULLETT, Ph.D., Columbia University. Prof. of History

ROBERT MUNMAN, Ph.D., Harvard University. Asst. Prof. of Art History

CHARLES G. NAUERT, JR., Ph.D., University of Illinois. Prof. of History

OSMUND OVERBY, Ph.D., Yale University. Assoc. Prof. of Art History

GEORGE B. PACE, Ph.D., University of Virginia. Prof. of English

MEYER REINHOLD, Ph.D., Columbia University. Prof. of Classical Languages

JOHN R. ROBERTS, Ph.D., University of Illinois. Assoc. Prof. of English

ROBERT J. ROWLAND, Ph.D., University of Pennsylvania. Assoc. Prof. of Classical Languages

ROBERT RUGH, Ph.D., Harvard University. Assoc. Prof. of History

PAULA SOMMERS, M.A., Stanford University. Instr. in Romance Languages

JOHN C. THIBAUT, Ph.D., University of Illinois. Prof. of Classical Languages

HOMER L. THOMAS, Ph.D., Edinburgh. Prof. of Art History and Archaeology

VERN G. WILLIAMSEN, Ph.D., University of Missouri-Columbia. Assoc. Prof. of Romance Languages

RUSSELL ZGUTA, Ph.D., Pennsylvania State University. Asst. Prof. of History

The University of Missouri-Columbia has recently formalized cross-departmental graduate study in art, history, languages and literature, music, and the thought of the Medieval and Renaissance period. Faculty members from the Departments of Art History, Classical Studies, English, History, Music, Philosophy, and Romance Languages comprise the staff of the Medieval and Renaissance Area Studies Program. Therefore a student pursues a graduate degree through one of the participating departments offering a Ph.D.

Under the guidance of the Area Committee (and while fulfilling the requirements set by the department), the candidate selects courses for a strong, minor field from those offered in the Medieval and Renaissance period, and earns, for example, a Ph.D. in Art History and Medieval Studies, or an M.A. in History and Renaissance Studies. The programs are flexible.

The course offerings in Medieval and Renaissance Studies are extensive. Faculty specializations include early medieval and Byzantine art and architecture, renaissance architecture, late medieval and northern renaissance art and architecture, medieval and renaissance music, medieval Russian history, renaissance and reformation history, English intellectual and cultural history of the sixteenth and seventeenth centuries, English political history of the sixteenth and seventeenth centuries, history of science, medieval French literature and philology, French renaissance literature, medieval Spanish literature and philology, Spanish literature of the golden age, Italian renaissance literature, Portuguese renaissance literature, Old English, medieval drama, medieval religious literature, Chaucer, Middle English language and literature, Shakespeare, Tudor and Stuart drama, Spenser, sixteenth century lyric poetry, sixteenth century prose and poetry, seventeenth century prose and poetry, English recusant literature, and medieval philosophy.

The UMC Library contains extensive collections appropriate to the Area. These are described more fully in the Library Resources Section.

For information regarding fellowships, write to the Director of Graduate Studies of the department of major interest.

DEGREE REQUIREMENTS

Since the Area does not confer degrees in itself, a student must first be accepted by a participating department for advisement as a graduate student. To participate in the Medieval and Renaissance Area Studies Program he must also be accepted into that program. The Area Committee selects students from those making application for the Program; admission qualifications are based on the GPA in related course work; the GRE or similar standardized test scores; and the applicant's general background, especially in languages.

For the Ph.D. degree, at least two languages are required; however, additional languages may be required according to the area of specialization. The individual departments determine the thesis requirements for the M.A. degree.

MICROBIOLOGY AREA PROGRAM

ROBERT T. MARSHALL, Ph.D., University of Missouri-Columbia. Prof. of Food Science & Nutrition.

JOHN M. MCKENNA, Ph.D., Lehigh University. Director of Graduate Studies (1971-72); Prof. of Microbiology

JAMES T. BARRETT, Ph.D., University of Iowa. Prof. of Microbiology

JOSEPH E. EDMONDSON, Ph.D., Iowa State University. Prof. of Food Science & Nutrition

FRANK B. ENGLE, JR., Ph.D., University of Pennsylvania. Prof. of Microbiology

MARION L. FIELDS, Ph.D., Purdue University. Prof. of Food Science & Nutrition

HERBERT S. GOLDBERG, Ph.D., Ohio State University. Prof. of Microbiology

CHARLES S. GOWANS, Ph.D., Stanford University. Prof. of Biological Sciences

ARTHUR H. HARRISON, Ph.D., University of Maryland. Prof. of Biological Sciences

RAYMOND L. LOAN, D.V.M., Washington State University; Ph.D., Purdue University. Prof. of Veterinary Microbiology

GEORGE S. SHELTON, D.V.M., Texas A & M; Ph.D., University of Minnesota. Prof. of Veterinary Microbiology

OLEN R. BROWN, Ph.D., University of Oklahoma. Assoc. Prof. of Veterinary Microbiology

DAVID J. HENTGES, Ph.D., Loyola University of Chicago. Assoc. Prof. of Microbiology

DAN MERTZ, Ph.D., University of Texas. Assoc. Prof. of Biological Sciences

LEROY D. OLSON, D.V.M., University of Minnesota; Ph.D., Purdue University. Assoc. Prof.

of Veterinary Pathology

JOSEPH T. PARISI, Ph.D., Ohio State University.

Assoc. Prof. of Microbiology

RONALD F. SPROUSE, Ph.D., University of Oklahoma. Assoc. Prof. of Veterinary Microbiology and Medical Microbiology

LINDA CHAPMAN, Ph.D., University of California at Los Angeles. Asst. Prof. of Biological Sciences

JOHN GRUNAU, Ph.D., Cambridge University. Asst. Prof. of Biological Sciences.

The Area Program in Microbiology offers work of an interdisciplinary nature leading to the degree of Doctor of Philosophy. The Program is jointly staffed by faculty in these departments: from the College of Agriculture, the Department of Food Science and Nutrition; from the School of Medicine, the Department of Microbiology; from the College of Arts and Science, the Division of Biological Sciences; and from the School of Veterinary Medicine, the Departments of Veterinary Pathology and Veterinary Microbiology.

The Area views the field of Microbiology as one that is changing rapidly as new techniques are developed for obtaining biological information at the subcellular or molecular level. With the broad scope of the program and its cross-departmental organization, the Area keeps abreast of technical changes and advanced research techniques.

Special facilities for study and research in microbiology include: infrared, ultraviolet, and visible light spectrophotometers; ultraviolet, darkfield, phase, and electron microscopes; high speed preparative and analytical ultracentrifuges; lyophilization equipment; column chromatography; and paper, disc, starch and gel electrophoresis.

The distinct areas of concentration which a student may pursue are antibiotics; anti-sepsis, disinfection and sterilization; ecology; immunology; microbial genetics; mycology; parasitology; microbial physiology; virology; infectious disease; aspects of microbial pathology; and food microbiology.

The Area Program in Microbiology is designed to prepare students for advanced professional careers in universities and colleges, research institutes, public health and hospital laboratories, and industrial research.

Many students admitted to the area program are awarded teaching or research assistantships. These are administered through the participating departments. Under the guidance of faculty members, teaching assistants are given practical experience in planning, organizing, teaching, laboratory preparation, and evaluating subject matter in microbiology. Similarly, research assistants work with faculty members who are conducting research projects in microbiology and related fields. In this way research assistants obtain practical experience in the planning of research proposals, the collection of research data, and the writing of research reports.

Write the area program director for further information.

THE Ph.D. PROGRAM

To be accepted for advisement in the area program, a student should have completed the following courses: mathematics through college algebra, 10 hours of chemistry including organic, 10 hours of biology, and 5 hours of physics.

The Master's degree or a professional college degree (M.D. or D.V.M.) may be accepted as meeting requirements for admission in lieu of the minimal grade point average stipulated under Regulations for Admissions, providing the applicant attained a minimal grade point average of 3.0/4.0 in graduate courses.

To be considered for candidacy in the Ph.D. program, an applicant must show satisfactory performance on a qualifying examination administered by the Advisory Committee. The University of Missouri-Columbia Master's examination may be accepted in lieu of the Ph.D. qualifying examination.

This program normally requires three years beyond the Master's degree and consists of (1) a course of study, (2) practical experience in teaching and research, (3) a comprehensive examination, and (4) demonstration of research and writing ability by completing a doctoral dissertation on an approved research problem.

The majority of the student's advisory and examining committees shall be from the Area faculty. Under the guidance of an advisory committee, a course of study is individually designed to fit each student's academic background, experience,

and objectives. Courses normally suggested for completion include one course each in calculus, physical chemistry, and statistics; one general and two advanced courses in biochemistry; and 18-20 hours in 300- and 400-level courses in microbiology. Courses may be chosen from one or more departments, as determined by the advisory committee, but shall constitute a definite plan of training for research or scholarly investigation in some particular aspect of microbiology.

The final examination will cover chiefly the dissertation. Refer also to the regulations governing Ph.D. degrees as listed elsewhere in this bulletin.

NUCLEAR ENGINEERING

THOMAS F. PARKINSON, Ph.D., University of Virginia. Chairman; Prof. of Nuclear Engineering

ROBERT L. CARTER, Ph.D., Duke University. Prof. of Electrical and Nuclear Engineering

ARDATH H. EMMONS, Ph.D., University of Michigan. Vice-President for Research; Prof. of Nuclear Engineering and Radiological Sciences

WILLIAM R. KIMEL, Ph.D., University of Wisconsin. Dean, College of Engineering; Prof. of Nuclear Engineering

STANLEY R. BULL, Ph.D., Stanford University. Director of Graduate Studies; Assoc. Prof. of Nuclear Engineering

PHILLIP K. LEE, Ph.D., Purdue University. Asst. Prof. of Nuclear Engineering and Radiological Sciences

SUDARSHAN K. LOYALKA, Ph.D., Stanford University. Asst. Prof. of Nuclear Engineering

C. LEON PARTAIN, Ph.D., Purdue University. Assoc. Prof. of Nuclear and Electrical Engineering; Assoc. Investigator in the Space Sciences Research Center

DARROL H. TIMMONS, Ph.D., Kansas State University. Asst. Prof. of Nuclear Engineering

JAMES R. VOGT, Ph.D., University of Kentucky. Manager of Reactor Facility Nuclear Science Research Group; Asst. Prof. of Nuclear Engineering

The Area Program in Nuclear Engineering offers graduate work and supervised research experience leading to the degrees of Master of Science and Doctor of Philosophy. The graduate program in nuclear engineering is open to students with Bachelor's degrees in physics, chemistry, mathematics, and in chemical, civil, electrical, mechanical, and nuclear engineering.

Specific areas of concentration which a student may pursue are in the various research programs of the faculty. These include the study of MURR kinetics and stability utilizing the technique of neutron noise analysis, neutron spectrum measurements, studies of neutron thermalization and transport in anisotropic media, theoretical studies on the transport of neutrons and rarefied gases, neutron activation analysis, neutron radiography, and studies of the feasibility of computer control of reactors.

Area research is facilitated by several special research facilities and laboratories. The University of Missouri Research Reactor (MURR) is a high-flux reactor designed to operate at a power of 10 MW. The reactor, fueled with uranium enriched to greater than 93 per cent in the isotope U-235, is water cooled and moderated and is reflected with beryllium metal and graphite. The volume in the center of the reactor fuel annulus consists of two regions. The inner region is a "flux trap" which is accessible from the pool surface for insertion and removal of experiments.

The reactor services the following facilities: (1) center test hole, or "flux trap," (2) three six-inch I.D. beam tubes, (3) three four-inch I.D. beam tubes, (4) four pneumatic tube irradiation positions, (5) eight reflector region irradiation positions, and (6) a 4' x 4' thermal column.

The Pulsed Neutron Generator accelerates deuterons to 150 kev energy to produce 14 Mev neutrons via the $T(d,n)$ reactions. It may be operated in either pulsed or continuous mode; for the latter the maximum neutron production is 10^{11} neutrons per second.

Other facilities include:

Subcritical Training Reactor: natural uranium metal fuel and H_2O moderator; neutrons supplied by a 5 Ci Pu-Be source.

^{60}Co Irradiator: The irradiator contains approximately 5,000 curies of ^{60}Co and is installed in a pool at the MURR facility.

Nuclear Instrumentation: Multichannel Analyzers: 1024 and 400 channel units; Semiconductor Detectors; Scintillation Counters; GM Counters; Gas Flow Proportional Counters; Liquid Scintillation Counters; Neutron Counters; BF_3 , 3He , $^6Li(Eu)$.

Digital Computers: IBM 360/65; IBM 360/50 (open shop for students).

Analog Computers: two EAI TR-48's; Cross-correlation computer.

The Main Library has over one million volumes; the Engineering Library, over 25,000 volumes.

The area program has available traineeships of the National Science Foundation, the Atomic Energy Commission, NDEA, and part-time teaching and graduate research assistantships.

DEGREE REQUIREMENTS

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on the basis of this record alone. To be accepted for advisement in the graduate program in Nuclear Engineering a student must have taken the GRE, verbal and quantitative sections. An applicant with an undergraduate GPA of less than 3.0/4.0 will be considered if other criteria of performance give strong indication such a student will be successful in graduate work in this field. The titles of specific courses or areas of concentration and number of hours required prior to entrance into the graduate program are as follows: (1) in physics: one year of general physics and one additional semester of atomic and nuclear physics; (2) in chemistry: one year of general courses; (3) in mathematics: three years, including one semester of differential equations and one year of senior level mathematics; (4) in engineering science: one semester of thermodynamics and one semester of heat transfer.

A minimum of 30 credit hours of graduate level courses, to be approved by the student's adviser, are required for the Master of Science degree. The courses must include a minimum of 15 credit hours of 400-level Nuclear Engineering courses, other than NE 410 or NE 490. A thesis, which can be used to fulfill 6 of the 30 credit hours of study (NE 490), is required of all M.S. candidates. An oral examination on the thesis is required.

There are no language or collateral field requirements for the M.S. degree. An average grade of 3.0 or better is required.

The qualifying examination for admission to candidacy to the Ph.D. degree is

based upon the prerequisites and basic course requirements for the M.S. degree in nuclear engineering outlined above. The program of study is determined by the student with his advisory committee and subject to approval by the Graduate Dean. A dissertation and an oral examination on the dissertation are required. An average grade of 3.0 or better is also required.

NUTRITION AREA PROGRAM

THOMAS D. LUCKEY, Ph.D., University of Wisconsin. Chairman; Director of Graduate Studies; Prof. of Biochemistry

MARGARET A. FLYNN, Ph.D., University of Missouri-Columbia. Assoc. Prof. of Food and Nutrition

RUTH N. LUTZ, Ph.D., Cornell University. Prof. of Nutrition and Dietetics

FREDRIC A. MARTZ, Ph.D., Purdue University. Area Secretary; Assoc. Prof. of Dairy Husbandry

BOYD L. O'DELL, Ph.D., University of Missouri-Columbia. Prof. of Agricultural Chemistry

WILLIAM H. PFANDER, Ph.D., University of Illinois. Prof. of Animal Husbandry

JAMES E. SAVAGE, Ph.D., University of Missouri-Columbia. Prof. of Poultry Husbandry

MYRON E. TUMBLESON, Ph.D., University of Minnesota. Asst. Prof. of Veterinary Physiology and Pharmacology

ROBERT L. WIXOM, Ph.D., University of Illinois. Assoc. Prof. of Biochemistry

The Area Program in Nutrition provides an interdisciplinary program leading to a Master of Science in Nutrition or a Ph.D. in Nutrition. The area program is designed to provide a foundation in the many scientific aspects of nutrition. This is accomplished by a core of courses on which a student builds his entire graduate program. Specialized research is conducted in several departments on the Columbia Campus, these are: from the College of Agriculture, the Departments of Agricultural Chemistry, Animal Husbandry, Dairy Husbandry, and Poultry Husbandry; from the School of Medicine, the Department of Biochemistry; from the School of Veterinary Medicine, the Department of Physiology and Pharmacology; and jointly, the School of Home Economics and the staff of Nutrition and Dietetics of the Medical Center. Thus, a basic foundation is insured yet

the student is able to specialize in one area of Nutrition.

Students may concentrate in one of these areas of experimental nutrition: human, swine, poultry, ruminant, and laboratory animals. Additionally, a student may concentrate on studies involving a specific nutrient in several species of animals.

Chemical laboratories and animal facilities enable students to conduct both basic and applied nutrition research. Analytical laboratories facilitate research on major and trace minerals, amino acids, lipids, and related substances. Radioactive isotopes can be used through the facilities in several laboratories, as well as the whole body radiation detector facility. The Animal Science building provides modern research facilities for both chemical and animal research.

All of the major journals in the field of Nutrition are on hand in the libraries on the campus. The whole body radiation detector and the gradient layer calorimeter enable unique studies in the field of Nutrition.

Research support is obtained from the U.S. Department of Agriculture, Public Health Service, Atomic Energy Commission, as well as State and private sources. Fellowships and assistantships are available through the various departments represented in the Area. Apply to the Director of Graduate Studies of the Area of Nutrition, or to the department in which one plans to do Nutrition research.

AREA PROGRAM IN PATHOLOGY

ROBERT N. GOODMAN, Ph.D., University of Missouri-Columbia. Department Chairman of Plant Pathology; Prof.

FRED V. LUCAS, M.D., University of Rochester. (On Leave of Absence.) Prof. of Pathology.

DONALD A. SENHAUSER, M.D., College of Physicians & Surgeons. Acting Chairman, Department of Pathology; Prof. of Pathology

LAWRENCE G. MOREHOUSE, Ph.D., Purdue University; D.V.M., Kansas State University. Director of Veterinary Medical Diagnostic Laboratory; Prof. of Veterinary Pathology

THOMAS D. WYLLIE, Ph.D., University of Minnesota. Director of Graduate Studies; Prof. of Plant Pathology

VICTOR DROPKIN, Ph.D., University of Chicago. Prof. of Plant Pathology

LOREN D. KINTNER, M.S., University of Missouri-Columbia; D.V.M., Ohio State University.
 Prof. of Veterinary Pathology

DONALD A. B. LINDBERG, M.D., College of Physicians and Surgeons. Prof. of Pathology

WILLIAM Q. LOEGERING, Ph.D., University of Minnesota. Distinguished Visiting Prof. of Plant Pathology

DONALD E. RODABAUGH, M.S., University of Missouri-Columbia; D.V.M., Kansas State University. Prof. of Veterinary Pathology

DONALD A. SCHMIDT, Ph.D., D.V.M., Michigan State University. Prof. of Veterinary Pathology

HARRY H. BERRIER, M.S., University of Missouri-Columbia; D.V.M., Kansas State University.
 Assoc. Prof. of Veterinary Pathology

RUSSEL V. BROWN, Ph.D., Iowa State University.
 Assoc. Prof. of Veterinary Pathology

OSCAR H. CALVERT, Ph.D., University of Wisconsin. Assoc. Prof. of Plant Pathology

RONALD E. FLATT, Ph.D., D.V.M., University of California. Assoc. Prof. of Veterinary Pathology

ENAR W. PALM, Ph.D., University of North Dakota. Assoc. Prof. of Plant Pathology

ARLENE P. MARTIN, Ph.D., University of Rochester. Assoc. Prof. of Pathology

CHARLES C. MIDDLETON, M.S., Michigan State University; D.V.M., University of Missouri-Columbia. Assoc. Prof. of Veterinary Pathology

DANIEL R. MILLIKAN, Ph.D., University of Missouri-Columbia. Prof. of Plant Pathology

STUART L. NELSON, Ph.D., Purdue University; D.V.M., Ohio State University. Assoc. Prof. of Veterinary Pathology

LEROY D. OLSON, Ph.D., Purdue University; D.V.M., University of Minnesota. Assoc. Prof. of Veterinary Pathology

JAMES B. PACKER, M.D., Temple University School of Medicine. Assoc. Prof. of Pathology

OM P. SEHGAL, Ph.D., University of Wisconsin. Assoc. Prof. of Plant Pathology

BILLY G. TWEEDY, Ph.D., University of Illinois. Assoc. Prof. of Plant Pathology

HUBERT J. VAN PEENEN, M.D., University of California School of Medicine. Assoc. Prof. of Pathology

MARIE L. VORBECK, Ph.D., Cornell University.
 Assoc. Prof. of Pathology

MERTON F. BROWN, JR., Ph.D., University of Iowa. Asst. Prof. of Plant Pathology

ANTON T. NOVACKY, Ph.D., Czechoslovak Academy of Sciences. Asst. Prof. of Plant Pathology

CHARLES H. BALDWIN, JR., Ph.D., Oregon State University. Asst. Prof. of Plant Pathology

JAMES EASTERLY, M.D., University of Chicago School of Medicine. Asst. Prof. of Pathology

The Ph.D. Area Program in Pathology is a new degree offering of the Graduate School. It is jointly staffed and presented

by the Departments of Pathology, Veterinary Pathology, and Plant Pathology of the Schools of Medicine and Veterinary Medicine, and the College of Agriculture respectively.

The program is designed to provide students with the opportunity to examine and use research concepts and methods indigenous or peculiar to each of the three areas of pathology. In its approach to comparative pathology, it allows the opportunity to obtain training in breadth or in depth in studies of disease mechanisms or processes in various host species.

Through joint seminars and committee appointments, and cooperative efforts in course offerings, the program is designed to create an atmosphere for meaningful interdisciplinary dialogue and research cooperation among graduate students and faculty of the existing pathology departments on the campus. This objective is further implemented through a close advisory committee made up of one member from each of the pathology departments.

A Ph.D. candidate may choose his plan of research to take advantage of the interests and specialties of the various Ph.D. advisers. Among these research areas are ultrastructure research, membrane transport systems, immunopathology, phytobacteriology, enzymology, and electron transport systems in tissue, oncology, host cell-pathogen relationships and pathogenesis of avian and mammalian disease (companion animal, food-companion animal, food-producing animal, and spontaneous disease of laboratory animals).

There are excellent facilities for research in pathology. In addition to standard equipment suitable for research in each area, special items in the various departments include: six electron microscopes, six walk-in plant growth chambers capable of environmental control within close tolerances, chromatographic equipment (gas-liquid, column, paper and thin-layer), spectrophotometers, low-high speed and ultracentrifuge electrophoresis apparatuses, mass spectrometer, Warburg respirometers, liquid scintillation and thin window radioisotope counters, ultra-microtomes, radiometer blood gas analyzer.

Facilities also include necropsy and clinical pathology laboratories for supportive course work (Medical and Veterinary Pa-

thology), research laboratories in medical, plant and veterinary medical pathology and two research farms.

Various stipends are available including teaching assistantships, and postdoctoral fellowships. Write to one of the chairmen of the specific pathology departments for application forms.

DEGREE REQUIREMENTS

To be considered for admission to the Ph.D. area program in Pathology, an applicant should hold the M.S. degree in plant pathology, or a closely related field of biological science, or be a graduate with a degree of M.D., D.V.M., or D.D.S.

An applicant should take Part I (General Aptitude) of the GRE before entering Graduate School, or during the first semester of graduate study. All students must pass a qualifying examination for admission to candidacy. Check the regulations governing doctoral candidates set by the Graduate School and listed elsewhere in this bulletin.

A student's course of study includes a "core curriculum" which must be met at some time before a student graduates. These subjects are not requirements for admission. If adequate evidence is established for prior work in these areas, or their equivalents, they need not be repeated. The student is referred to chairmen of specific departments for additional information on course requirements. The core curriculum is as follows: a three-hour introductory course in comparative pathology, as well as comparative pathology seminars meeting one hour per week for each semester the student is enrolled; a basic course in microbiology and an advanced course in virology, bacteriology, mycology, immunology, depending on the interests of the student; an introductory course and two advanced courses in biochemistry, or one advanced course in biochemistry and a semester of physical chemistry; one basic and one advanced course in genetics; Mathematics 80 or an acceptable equivalent; an introductory course in statistics; one course in scientific instrumentation.

In addition to the core curriculum, a dissertation is required. Abilities developed in the preparation of the dissertation should

include (1) logical thought regarding technical aspects of pathology and areas to which it relates, (2) planning and conducting of independent objective research investigations, and (3) the ability to communicate scientific results in writing. In addition to presenting the dissertation in the format set by the Graduate School regulations, the doctoral candidate is required to prepare it in form for publication in an edited journal in the field.

See also the regulations governing doctoral programs elsewhere in this bulletin.

PHYSIOLOGY AREA PROGRAM

CHARLES P. MERILAN, Ph.D., University of Missouri-Columbia. Executive Secretary of Physiology Area; Prof. of Dairy Husbandry; Assoc. Investigator in Space Sciences Research Center

HAROLD V. BIELLIER, Ph.D., University of Missouri-Columbia. Prof. of Poultry Husbandry
ROBERT P. BREITENBACH, Ph.D., University of Wisconsin. Prof. of Zoology

HOMER E. DALE, Ph.D., D.V.M., University of Missouri-Columbia. Prof. of Veterinary Physiology and Pharmacology

JAMES O. DAVIS, Ph.D., University of Missouri-Columbia. M.D., Washington University. Prof. Physiology; Chairman

BILLY N. DAY, Ph.D., Iowa State University. Prof. of Animal Husbandry

WARREN R. FLEMING, Ph.D., University of Oregon. Prof. of Zoology

DOUGLAS M. GRIGGS, JR., M.D., University of Virginia. Prof. of Physiology

HAROLD D. JOHNSON, Ph.D., University of Missouri-Columbia. Prof. of Dairy Husbandry; Chairman

ALLEN W. HAHN, Ph.D., Drexel Institute. Prof. of Veterinary Medicine and Surgery; Investigator in Space Sciences Research Center

SAUL D. LARKS, Ph.D., University of California. Prof. of Veterinary Physiology and Pharmacology

JOHN F. LASLEY, Ph.D., University of Missouri-Columbia. Prof. of Animal Husbandry

DENNIS T. MAYER, Ph.D., University of Missouri-Columbia. Prof. of Agricultural Chemistry; Chairman

DALLAS K. MEYER, Ph.D., University of Missouri-Columbia. Prof. of Physiology

MERLE E. MUHRER, Ph.D., University of Missouri-Columbia. Prof. of Agricultural Chemistry

X. J. MUSACCHIA, Ph.D., Fordham College. Prof. of Physiology; Investigator in Space Sciences Research Center

WESLEY S. PLATNER, Ph.D., University of Missouri-Columbia. Prof. of Physiology

MILTON D. SHANKLIN, Ph.D., University of Missouri-Columbia. Prof. of Agricultural Engineering

FRANK E. SOUTH, Ph.D., University of California. Prof. of Physiology; Investigator in Space Sciences Research Center

RALPH R. ANDERSON, Ph.D., University of Missouri-Columbia. Assoc. Prof. of Dairy Husbandry

MARVIN L. ZATZMAN, Ph.D., Ohio State University. Assoc. Prof. of Physiology

WILLIAM P. PALMORE, Ph.D., Yale University. Asst. Prof. of Veterinary Physiology

The Area of Physiology offers graduate study leading to the degrees of Master of Science and Doctor of Philosophy in Physiology. The faculty of this Area includes members from nine Departments in the School of Medicine, School of Veterinary Medicine, College of Agriculture, and the College of Arts and Science. The graduate programs of these departments (Physiology, Veterinary Physiology and Pharmacology, Veterinary Medicine and Surgery, Agricultural Chemistry, Agricultural Engineering, Animal Husbandry, Dairy Husbandry, Poultry Husbandry, and Biological Sciences) are described elsewhere in this bulletin.

The graduate programs in the Area of Physiology are designed to provide in-depth training to meet the individual student's needs. The Area affords a unique opportunity for the student to explore the frontiers of knowledge at the interface between one or more specialized fields in Physiology. The possibilities for cross-fertilization of ideas and concepts through a multi-disciplinary approach should be readily apparent from a brief listing of the research specialties and interests of the Area Faculty. These specialties and interests include: behavioral physiology, cardiac physiology, cellular physiology, cryobiology, depressed metabolism, endocrinology, environmental physiology, fetal cardiology, partitional calorimetry and bioenergetics, physiological chemistry and blood clotting mechanisms, physiological genetics, physiology of cell preservation, radiation biology, reproductive physiology, and respiratory physiology.

The doctoral program is emphasized within the Area since it is oriented specifically toward preparation for basic re-

search and for college and university teaching.

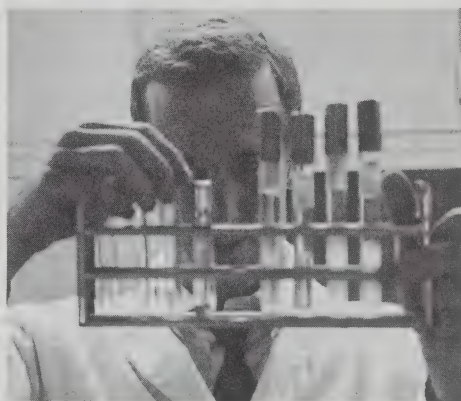
The Area of Physiology, through its faculty and their departments, participates in a broad program of research and graduate education. This involves the specialized major facilities of the Nuclear Reactor, Low Level Radiation Laboratory, Sinclair Comparative Medical Research Farm, Space Sciences Research Center, The Climatic Laboratory, and The Thermoelectric Partitional Calorimeter. Also, extensive basic research instrumentation and facilities are available in the several departments.

Additional information in the various facets of the Area of Physiology may be obtained from the Executive Secretary, Area of Physiology, Graduate School, 205 Jesse Hall, Columbia, Missouri 65201.

DEGREE REQUIREMENTS

All candidates for admission to the Area should have completed the following college semester hours or their equivalents: Mathematics, 5; Inorganic and Organic Chemistry, 10; Biology (Zoology), 10; and Physics, 5. A candidate shall submit scores on the Graduate Record Examination or on the Medical College Admissions Test, and three letters of recommendation from former teachers at the undergraduate or graduate level.

The Ph.D. candidate must take both a written and oral qualifying examination to evaluate his training and needs in the following subjects: mammalian physiology; statistics and/or mathematics; biochemistry or physical chemistry. The qualifying examination serves as a basis for planning the candidate's program of study and is



administered by an appointed five-man Advisory Committee.

The course work and research requirements for the M.S. degree will be determined by the student's adviser from the Area faculty. The course work, language, and research requirements for the Ph.D. degree will be determined by a committee having a majority of its members from the Area.

AREA OF SANITARY SCIENCE

JOSEPH E. EDMONDSON, Ph.D., Iowa State University. Chairman; Director of Graduate Studies; Prof. of Food Science and Nutrition

LINDON J. MURPHY, P.C.E., Iowa State University. Prof. of Civil Engineering

ROBERT T. MARSHALL, Ph.D., University of Missouri-Columbia. Prof. of Food Science and Nutrition

CHARLES V. WRIGHT, M.P.H., University of California. Assoc. Prof. of Civil Engineering

The Area Program in Sanitary Science offers graduate work of an interdisciplinary nature leading to the degree of Master of Science. The program was established to provide specific graduate training for professional public health workers in many aspects of environmental health. The professional emphasis in the area program is made possible by the integration of the facilities and programs in the Colleges of Agriculture, Engineering, and Arts and Science, and the School of Medicine. The program involves the staffs of the Colleges of Agriculture and Engineering. The organization of the program provides an interdisciplinary approach to the many problems involved with public health. The program's course offerings, seminars, and research facilities are presented cooperatively.

Some of the facilities for research include well-equipped laboratories for basic studies in water pollution, and chemical and microbiological laboratories for graduate study of the many facets of environmental sanitation.

There is great demand by cities, states, industry, and the Federal government for men trained in sanitary science. The program is designed to supplement the training of milk or food technologists, chem-

ists, microbiologists, and entomologists with the principles and applications of public health. The M.S. candidate may choose one of the several research programs for his research interest: milk or food sanitation, water pollution, water resources, sewage disposal, vector control, and many other environmental health areas. Most of these may be studied from the chemical, microbiological, or physical point of view.

The area receives some special teaching or training funds from the U.S. Public Health Service. From one to three traineeships have been granted to students pursuing the M.S. program in Sanitary Science. Applications for traineeships may be obtained by contacting the Chairman of the Sanitary Science Area Committee, 1-74 Agriculture Building, Columbia, Missouri 65201.

The Area Program has received support for several eight-week summer session programs in environmental sanitation. These summer programs are now accepted for graduate credit. Students from the mid-U.S. area are acceptable for admission to the summer program. In the past, enrollments have been limited to 25 students.

To be considered for admission to the M.S. Area Program in Sanitary Science, the applicant must have a B.S. or A.B. degree with a major in science or a closely related field. The applicant should complete the GRE as required by the Graduate School and otherwise meet the minimum standards for admission to the Graduate School.

The core courses required to complete the M.S. program are Public Health Administration, Epidemiology, Health Education, Vital Statistics, and Environmental Sanitation. Elective courses, bringing the total to 30 hours, are to be selected from sanitary science and related fields with the consent of the student's advisory committee; of the total, 15 hours must be in 400-level courses.

All students will conduct a field or laboratory research problem, the results of which will be prepared in a form suitable for publication in a scientific public health journal. This publication may be accepted in lieu of a thesis.

The M.S. candidate will be governed by regulations pertaining to the Master's de-

gree programs listed elsewhere in this bulletin.

SOUTH ASIA LANGUAGE AND AREA STUDIES

N. GERALD BARRIER, Ph.D., Duke University.
Director of the South Asia Center; Assoc. Prof.
of History

SARLA D. NAGAR, M.A., Agra University. Asst.
Curator; South Asian Art

ROBERT BUSSABARGER, M.A., Michigan State
University. Assoc. Prof. of Art

K. N. KAR, M.A., University of Rangoon. Assoc.
Prof. of Philosophy

IMTIAZ AHMAD, Ph.D., University of Lucknow.
Visiting Asst. Prof. of Anthropology

WILLIAM A. NOBLE, Ph.D., Louisiana State Uni-
versity. Asst. Prof. of Geography

ROBERT PERINBANAYAGAM, Ph.D., University of
Minnesota. Asst. Prof. of Sociology

PAUL WALLACE, Ph.D., University of California.
Assoc. Prof. of Political Science

RODNEY MOAG, Ph.D. Candidate, University of
Wisconsin. Instructor in South Asian Lan-
guages and Literature

PREM SINGH, Ph.D. Candidate, Cornell Univer-
sity. Instructor in South Asian Languages and
Literature

MARY LAGO, Ph.D., University of Missouri-
Columbia. Translator of Bengali Literature

MURARI L. NAGAR, D.L.S., Columbia University.
South Asian Librarian and Lecturer, Depart-
ment of Classical Languages

PETER GARDNER, Ph.D., University of Penn-
sylvania. Assoc. Prof. of Anthropology

The South Asia Language and Area Center provides a central focus for a student who wishes to pursue specialization in South Asian studies at the M.A. or Ph.D. level. Graduate degrees are pursued through the departments which relate to the Center. In addition to the graduate degree, a certificate of specialization is awarded in conjunction with degrees in specific disciplines.

The participating departments are Anthropology, Classical Languages, Geography, History, Philosophy, Political Science, Sociology, and Social Work. The additional field of study is South Asian languages and literature which is directly administered by the Center. Those South Asian languages offered are Bengali, Hindi, Urdu, Malayalam, and Sanskrit, as well as a survey of classical and folk literature of South

Asia and a survey of modern South Asian literature.

The South Asia Program at the University of Missouri-Columbia was formally designated as a Language and Area Center under the National Defense and Education Act in 1965. The UMC South Asia Language and Area Center is one of 106 language and area centers for all parts of the world recognized and funded under the National Defense and Education Act.

The University is a Class A member of the American Institute of Indian Studies, a consortium and funding agency for the leading South Asia Centers in the country.

National Defense Foreign Language Graduate Fellowships (NDEA Title 6) are available. Individual departments also offer financial assistance, and applicants should contact them directly.

A significant South Asian collection in the UMC Library is growing systematically under the supervision of a permanent, full-time South Asian librarian. Particularly notable is the broad selection of books and microfilm on the Punjab area of South Asia. A collection of South Asian works of art is located in the Library Museum.

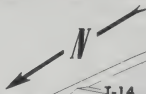
DEGREE REQUIREMENTS

A student must fulfill the degree requirements of the department through which he pursues his graduate degree. Students are expected to prepare themselves in language and area subjects in addition to departmental requirements. Remaining requirements are established so as to provide maximum flexibility to the student's goals and prior training. The object is to provide both depth and breadth, South Asia expertise in a discipline, and a meaningful exposure to the area on an interdisciplinary basis. Advisers may also require additional courses to supplement the candidate's undergraduate preparation in Asian studies.

Minimum South Asian courses for the M.A. degree are two years of a South Asian language and one minor field in South Asia (minimum six credits).

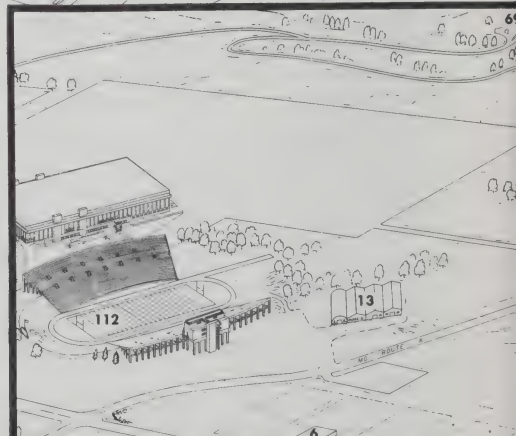
Ph.D. candidates must complete at least three years of a South Asian language, a minor field (minimum of six credits), and six elective credits in courses to be chosen from outside the major and minor fields.

UNIVERSITY OF MISSOURI-COLUMBIA

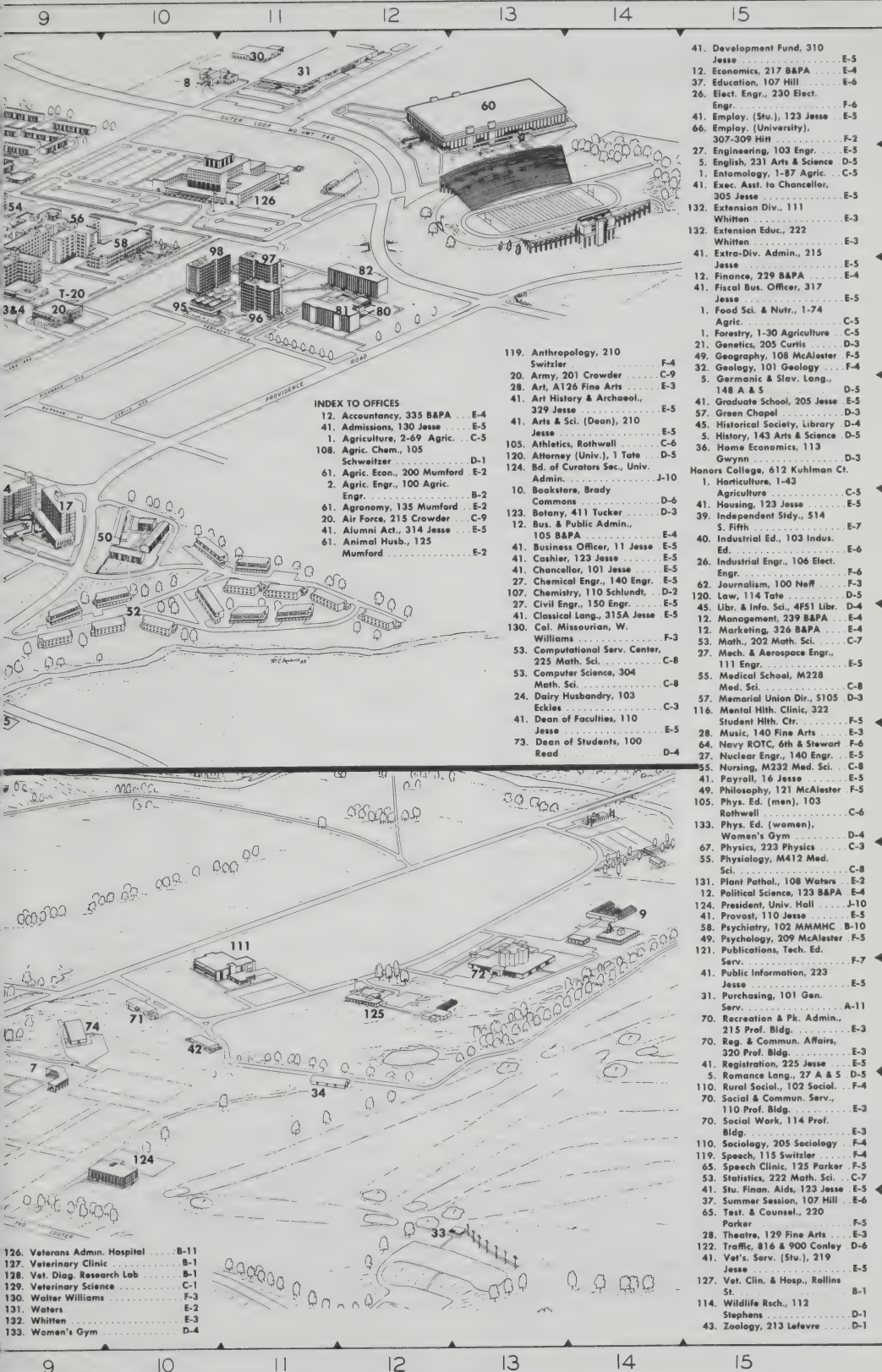


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